GAS JOURNAL

LIGHT ⁘ HEAT ⁘ POWER ⁘ BYE-PRODUCTS

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Editorial Notes.

Jubilee of the Midland Association.

THE members of the Midland Association of Gas Engineers and Managers last Thursday celebrated the jubilee of its foundation in social manner which left nothing to be desired in respect of variety, joyousness, and remembrance. We leave the story of the event as related in other columns to tell how good was the rejoicing at the completion of fifty years of co-operative work by men of like professional interests. The honour of presidency in this outstanding year in the history of the organization is that of Mr. F. C. Briggs, of Dudley, and right well he fulfilled his part on this occasion, as on others, as the official head. There must not be omission to mention, too, that, in the work of preparation for the occasion, he and the Committee received enthusiastic help from the Hon. Secretary (Mr. T. Thornton), upon whom, of course, fell so much of the detail. Among the principal guests was Mr. H. D. Madden, M.Inst.C.E., the President of the Institution of Gas Engineers.

The jubilee permits us to make our recognition of the notable work for the industry which has been contributed by the men who have been, or are, members of the Association. With most of those whose names were specially mentioned on the occasion as having played a distinguished part in the technical work and progress of the industry, we have had intimate friendship; and the existing members of the organization may well feel much pride in having had in their ranks men of such conspicuous ability. They were (as Mr. Madden said) giants in their day; and they contributed largely to the constructive work which has made the gas industry the strong and virile embodiment, technically and commercially, of which we are proud in these times when the goals of technical efficiency and commercial superiority are being striven for on every hand. Thus it is the Midland Association is proud of its history. The members have been in the van of all movement which has made for the furtherance of the interests of gas supply; and from many of the leaders there has issued that inspiration which is so helpful to others who may occupy positions of less affluence and opportunity, or who may be coming along to take place and share in the great work. Moreover, to us in the gas industry, the Association stands for something more than a band of technical men with common aspirations and interests; for in the area from which it draws its members, Murdoch moved and had his being, and did much of that fundamental work which has grown so magnificently, and is an ever enlarging monument to him. Still with us is Mr. Charles Hunt, who was in official work at Birmingham when that great political and administrative genius, Mr. Joseph Chamberlain, was Chairman of the Corporation Gas Committee.

The Association has a fine history; and we have every faith that the chapters that will be added to it in future will be composed of matter of such intrinsic value to the times and the work in hand that the traditions of the organization will be maintained at the standard set by a glorious past. To the harvest of the future, there will also be contribution from the technical men of the firms who undertake the industry's constructive work in respect of plant and appliances.

Carbonization Conference.

WE learn from the Hon. Secretary of the Joint Fuel Committee (Dr. E. W. Smith) that the preparations for the Carbonization Conference in Birmingham, from Feb. 21 to 24, are shaping well. The programme which has been received is replete with interest. The time and venue have been well chosen; for an opportunity is thus given for a visit to the British Industries Fair, in which the gas industry will have an imposing section. On that occasion, the members of the conference will be entertained to luncheon by the Birmingham Chamber of Commerce and the British Industries Fair Management Committee. Arrangements have also been made, through the kindness of the Corporation Gas Committee and the General Manager (Mr. A. W. Smith), for members to visit the gas-works. At the sittings, which will take place in the small Lecture Theatre of the Birmingham Mining Institute, there will be a variety of subject-matter, which deals with many of the technical phases of carbonization in the gas industry, the coke-oven industry, and by low-temperature processes. Other subjects will include blue and carburetted water gas, gas-works refractories, gas-works effluents, the handling of coke, and coal blending for carbonization. The full programme is reproduced on a subsequent page. It will be remembered that (for issue before the conference) a special number of the "JOURNAL" is being prepared, in which the original contributions will be printed, together with a précis of papers which have already been published.

Restoration and Progress in 1927.

GRATIFYING progress marks the financial and working records of the Gas Light and Coke Company for the past year; but it was a year in the forepart of which the Board, like other gas administrations, had to operate diligently for a recovery from the damage inflicted upon the undertaking, its customers, and stockholders by the labour disturbances of 1926. But (ignoring any uncertainties regarding current developments) it can to-day be said: "All is well." The consumers are now purchasing gas at 8·6d. per therm, which is the lowest price since the war, and 3d. per therm less than had to be charged early last year owing to heavy costs and prudent provision of foreign coal. That the Board were anxious to get down to the best possible trading figure as soon as possible is seen by the successive reductions during the year—1·4d., 0·8d., 0·4d., and 0·4d. from December. The proprietors are getting a dividend in respect of the second half of the year at the rate of £5 1s. 4d.; and the present price of gas bids them look hopefully for a higher

distribution for the current year. The sum brought forward is £121,577, or £56,931 more than at the end of 1926. Altogether, there is good cause for both consumers and proprietors to rejoice that the year of restoration of normal conditions has brought them to the position with which the Company start 1928.

The year 1926 was abnormal on account of the general strike and the coal stoppage and the importation of expensive foreign coal, the large change in values, and the variations necessitated in manufacture. The past year was abnormal in respect of gas prices and the discharging of obligations brought about by 1926. For these reasons alone there is little value, though there may be interest, in comparing the operations of 1927 with 1926; and it would make a long complicated tale in the case of this Company by going back to 1925, seeing that was the last year of working before amalgamation with the Brentford Company.

Let us first consider manufacturing costs so far as materials are concerned and working results. In 1926, the carburetted water-gas plants were kept busy, and made a large contribution to the supply of gas; last year, there was a reversion to a larger output of coal gas and less water gas. Consequently, more coal was used in 1927—2,641,904 tons, compared with 2,186,461 tons in 1926, or 461,443 tons more; and upon it £4,093,496 was spent, which was more than in 1926 by £169,515, which is small, having regard to the extra quantity used and the cost of the balance of coal from abroad. But that increase in coal has a big off-set in oil and coke. Of oil, 31,019,589 gallons were used in the strike year; while last year the Company's requirements, through the lower quantity of water gas made, were met by 17,780,620 gallons—a reduction of 13,238,969 gallons. The expenditure for oil last year was £298,590, as against £523,767 in 1926. Again, while £606,316 was expended for coke for water-gas making in 1926, the item stands at £282,733 for last year. Thus in the lessened outlay of £548,760 on oil and coke, there is a good surplus over the £169,515 extra spent on coal. The total outlay on manufacturing materials last year was £4,674,820, compared with £5,054,064 in 1926—a difference in favour of last year of £379,244. Through the greater quantity of coal carbonized in 1927, there was a substantial increase in the output of secondary products; and therefore (as will be seen from the details published on a later page) more coke and breeze have been sold, and considerably more tar has been used at the Company's chemical works, and less has been sold. While, through manufacturing conditions, a smaller quantity of coke was sold in 1926, prices, of course, were high through the scarcity of fuel. Hence the total amount received for secondary products last year was £2,263,864, as compared with £2,381,352, or £117,488 less. Deducting the revenue from secondary products from the payment for coal, we have a net cost of £1,829,632 for 2,641,904 tons, compared with £1,542,629 for 2,180,461 tons in 1926. Glancing at the items in the total receipts from secondary products, it is seen that coke contributed last year £1,437,890, or £266,457 less than in 1926, and breeze £91,322, or £70,052 less. On the other hand, tar last year yielded £638,088, or £201,460 more than in 1926; and ammoniacal liquor and sulphate of ammonia brought into the account £96,562, or £17,559 more. Thus, while coke and breeze combined gave less by £336,509, tar and ammoniacal liquor and sulphate together supplemented income by £219,019, which makes the lower revenue of £117,488 from secondary products last year, compared with the leaner coal gas production year of 1926.

Investigating the production figures, they are found to be excellent. The total quantity of gas made, at the actual average calorific value of 502 B.Th.U. per c.ft., was 246,192,905 therms, compared with 237,922,825 therms in 1926, or an increase of 8,270,080. In volume, the make was 49,047,064,000 c.ft.—an increase of 1,617,991,000 c.ft., which alone represents the annual business in many large and densely populated gas-consuming areas. Of the total quantity of gas produced, 13,839,538,000 c.ft. were carburetted water gas, and 35,207,526,000 c.ft. coal gas. In the coal strike year, 19,066,316,000 c.ft. of carburetted water gas were made, and 28,362,757,000 c.ft. of coal gas. Therefore last year the coal gas made was greater by 6,844,769,000 c.ft., while the carburetted water gas was less by 5,226,778,000 c.ft. The average make per ton of coal carbonized last year was 13,326 c.ft., compared with 13,007 c.ft. in 1926, in part of which all sorts and conditions of coal were charged into the retorts. The difference of 319 c.ft. per ton, multiplied by the 2,641,904 tons of coal carbonized, represents 842,767,376 c.ft. The oil used last year for carburetted water gas averaged 1·21 gallons per 1000 c.ft., as compared with 1·62 gallons in the coal stoppage year. These figures show how, apart from the price paid for imported coal and oil, the manufacturing operations were burdened and handicapped in 1926 by the extraordinary conditions.

In the report of the Directors, it is stated that the sale of gas during the year shows an increase of nearly 3 p.ct. "Nearly 3 p.ct." looks modest. Let us see what it means in volume. The total quantity of gas sold was 46,343,050,000 c.ft., which was no less than 1,298,564,000 c.ft. more than in 1926. At the actual value of 502 B.Th.U. per c.ft., these quantities represent 232,619,772 and 6,658,089 therms respectively. The sale of gas at the prices ruling at various periods of the year—11·6d., 10·2d., 9·4d., and 9d.—produced £9,487,972, compared with £8,930,304 in 1926, when the charges moved from 9·4d. to 10·6d. per therm—an increase of £557,668. In various places in the accounts, apart from gas sales, is seen the liveliness that is occurring in business expansion. The sum for rental of meters, stoves, and fittings has increased; the capital expenditure in the one year on new and additional mains and service-pipes and new meters and stoves was £594,690; and in the "distribution" items of the revenue account, repairs, maintenance, and renewals show increases. During the year, 26,495 new consumers were connected; and 96,865 additional gas-stoves were sold or let out on hire. These various figures constitute substantial testimony to constructive business operations, and are the justification for the expenditure on them in these highly competitive times.

However, to sum up, the total revenue of the year amounted to £13,051,224, as against £12,548,619 in 1926—an increase of £502,605. The expenditure was £11,314,235, compared with £11,210,773, or an increase of £103,462. Though the charges for manufacture were reduced, the outlay under the heading of distribution was more, and there is a charge for expenses in connection with the Brentford amalgamation. Deducting the increase of expenditure from the additional revenue, we have a difference of £399,143, which is the sum by which the balance—£1,736,989—carried to net revenue account is augmented. It is a good statement, and will be voted as highly satisfactory on Friday, when the Governor (Sir David Milne-Watson) has the pleasure of submitting the story of the year's operations to the proprietors.

The Radiation Trouble: Some Considerations.

THE much-discussed trouble which has come upon Radiation Ltd., we regard as a purely domestic question, with which Directors and shareholders are most competent to deal. However, taking a perfectly independent view of the position, it would, we are of opinion, be a pity if the incident (or whatever other term readers choose to apply) were allowed to blind other considerations; in fact, it is only a matter of justice that, at the present time, they should be kept clearly in mind.

At the outset, we should like, without commenting in any way on the issue between shareholders and Directors, to express the hope that the general meeting which, we understand, is to be specially expedited to February—instead of March—will see a total clearance of all difficulties and misunderstandings, and leave the Directors free once more to devote their undivided attention to the further development of the Company's successful business. Such a clearing-up would be to the benefit of the gas industry as a whole. Internal dissension is always destructive; and when it occurs in the affairs of a concern of such importance and technical leadership, the whole trade itself must be prejudicially affected, and its forward momentum lessened.

It is no disparagement of the work of competitors to

say it is generally recognized in the gas industry that Radiation Ltd. has earned a name for initiative and inventiveness, both as regards types of gas-consuming apparatus, and a far-seeing policy in matters vitally affecting the future of gas. In this latter respect, valuable service has, to our knowledge and to that of our professional readers, been rendered to the industry, often in ways quite outside any possible expectation of direct advantage to the Company. In regard to the question as to the amount, or the disposal, of the Company's profits, we would only make the remark that the business is conducted on an open competitive basis, and no one would purchase their apparatus if value and terms were not right. It is rather in connection with the bearing of the present situation upon the interests of the industry as a whole that we believe thoughtful members of it must be feeling, as we do, some considerable anxiety in existing circumstances, and are sharing the opinion that anything calculated to endanger the continued successful development of the Company would be fraught with serious possibilities to the industry as a whole. As we see it, Radiation cannot be described as a self-acting machine. Its success as a trading enterprise, and also as a weighty factor in the progress of the industry, is obviously the result of plans—plans wisely conceived, well matured, and carried out with skill and hard work. Plans do not evolve themselves; they emanate from individual minds. And not Radiation only, but the industry, are fortunate in the men who work together both in the management of the separate businesses, and in the counsels of the Company itself, in which joint counsels its policy has been continuously shaped.

When the Company was formed, it incorporated a big majority of the gas-stove firms in the country. The Managing-Directors of those firms, who have since been the Managing-Directors of Radiation, were men who had grown up with the gas-stove business from its early immature stages, and they had, in their various degrees, shared in the work of bringing that business to its then stage of development. The industry is one which has to work under exceptional conditions, not only on the commercial side, but also in special research to cultivate the scientific as well as the technical features of manufacture. With those peculiar conditions, the Directors had, by lifelong experience, acquired a familiarity amounting almost to second nature. But the time came when ampler scope was required if further progress were to be made. It was recognized that, in the keenness of modern business conditions, firms cannot mark time; if they cease to move forward, they inevitably start to go back. Accordingly, the combination was formed; and continued development of the business, and of the classes of apparatus made by the firms, was rendered possible on a scale which would have remained unattainable but for the new possibilities which the amalgamation enabled the Managing-Directors to open up. This fact (and this should, in our opinion, be emphasized) accounts for much of the position which has led to current controversy—a position which exceeds the most sanguine expectations formed at the advent of the Company. In other words, instead of the individual businesses receding, the combined concern made remarkable progress.

We hold no brief for Radiation. What is said, is said voluntarily, with the feeling that opportunity permits, and justice claims. There is no question that in Mr. Yates the Company have had a Chairman who has been something far more than the chairmen of large companies usually set-out to be. His prominent position in the gas-stove industry at the time of the amalgamation was an acknowledged one; and his work (over and beyond the successful guidance of the Company's commercial interests) in the origination of one new type of apparatus after another, and in the initiation and direction of far-reaching research work on a scale made possible only by the large resources of the combined concern, is a matter well within the knowledge of the gas industry, and will, we submit, give him a lasting place in its annals. The other Managing-Directors have, each in his own sphere and way, devoted to the service of the Company that ripe specialized experience to which we have referred. To observing eyes in the gas industry, there has been growing evidence of good team-work—constructive initiative and constructive criticism co-operating towards a common end. That this end has been attained is witnessed by the fact that Radiation, during a time of poor trade, and despite set-backs to industry in general, has been one of the most successfully-managed businesses in the country. For this state of things, there are due to the Chairman and his colleagues something more than congratulation—they deserve gratitude. Looking beneath the present trouble, there is seen good evidence that the shareholders, of whom there are many among our readers, are fortunate in the management of the Company; and all concerned with gas as a fuel have much to acknowledge to Radiation, in respect of both debt for the past, and hope for the future. Of such acknowledgment, we believe there will be no stint at this time.

In the interests of shareholders and Directors alike, and in those of gas generally, we hope that present controversies may be brought to an early and mutually satisfactory end. The effort to grasp at the shadow of a supposed further gain is only too likely, in our judgment, to put in jeopardy the substantial advantages already enjoyed. We believe the time cannot come too soon when the Directors, who have done so much to make Radiation all that it is to-day, may once more be free to give their undivided thought and energies to furthering the Company's prosperity.

Cardiff Tenants Fight for Freedom.

STRANGE things happen in Cardiff. The Cardiff Corporation are making their contribution. They believe that because they construct houses as other people have been doing for ages, they can do what was never thought of before they became suppliers of electricity—that is, prescribe for the tenants where they are to place their patronage for lighting and labour-saving heating agents. We know of no law which empowers them to do this; and if one does not exist, then they are acting *ultra vires*. We do, however, know of a law which invests every person (who is not legally disqualified) to request the gas suppliers, if he is within a certain distance of their mains, to furnish him with a supply of gas; and the suppliers must comply. There the tenants of any premises have a right conferred upon them, of which right the Cardiff Corporation are seeking to deprive the occupants of their dwellings on the Mynachdy and Ely housing estates, and are seeking to claim for their electricity undertaking a right to a lighting monopoly, which it does not legally possess.

What is more, the Corporation are showing the fist and manners of a despot to these tenants, who are of the poorer class. They admittedly have wired the houses for electric lighting; the tenants wish they had not. It is also true that they will permit application to be made to the municipal autocracy for "permission" to put in a gas cooker, if preferred. Such magnanimity deserves recognition, in face of the threat that, if the tenants do not discontinue gas for lighting, then out they must go. The Corporation dare not evict them on such grounds; if they took this extreme measure, they would make themselves ridiculous in the eyes of the whole country, apart from facing the probability of being summoned to appear in the Law Courts to answer an application for an injunction to restrain their Soviet-like method of dealing with householders who do not desire to patronize municipal electricity. Tenants who have not yet converted from electricity to gas have also been warned that, if they take that step, they will offend their municipal servants, who seek to be masters and dictators, and who will require them to look for a habitation where reigns the liberty of purchasing any lighting agent. By their threats they have added insult to injury. Naturally, the tenants are up in arms against the action of the municipal authorities. They say they cannot get any warmth from electric bulbs; they can from gas burners, which also help to keep their rooms free from dampness, and make them more cosy. They also find that electric bulbs cost 2s. 6d.; while a gas mantle, which costs a few pence, lasts longer. However, the tenants intend to

defend their freedom; and we do not blame them for doing so.

It is plain that the intention of the Legislature has always been to maintain open competition between gas and electricity; and the Cardiff Corporation, if they are wise, will recognize this—especially after the expression of the opinion of Parliament in the Newport (Mon.) Corporation Act of 1925, upon the representations made to them by the Gas Company. What the Corporation are realizing is that economical gas has for poor people attractions which electricity does not possess; and they fear that much of the money they have spent on trying to make electric lighting the compulsory system of illumination in these houses is fast becoming unremunerative. They entered into a speculation; they must shoulder the consequences. To the moral they should pay heed in their future administrative doings. To be consistent, they should also prohibit oil for lighting, and gas, coal, and coke for heating. The result would be highly instructive to the members of the Corporation, as well as to other municipal authorities.

Annual Meeting of the Institution.

The annual conference of the Institution of Gas Engineers will open at Cardiff on Tuesday, June 12, and will last four days, under the presidency of Mr. H. D. Madden, M.Inst.C.E., Engineer to the Cardiff Gas and Coke Company. The Lord Mayor is to welcome the members at the opening of the proceedings, and, with the Lady Mayoress, has invited them to a reception at the City Hall.

Glad Tidings.

All the chairmen of our big banking institutions have been telling the country that we are leaving behind the deep depression in industry and trade, from which we have been suffering all too long. Glittering prognostications have fallen from their lips regarding the future. "Already," says Mr. Hugh Tennant, "the business of the country has recovered beyond the level it had reached before the coal dispute began;" and the President of the Board of Trade (Sir Philip Cunliffe-Lister) tells us that an official estimate—only approximate though it can be—suggests to him that it is reasonable to place the net trade balance of last year in the region of £96,000,000; there having been an increase in our invisible exports over the previous year. Another gratifying feature is that employment has improved; and the last available statistics show us that, in respect of the week ended Jan. 16, the number of employed persons on the registers of the labour exchanges is the lowest for the third week in January since the boom year of 1920. The number of unemployed registered that week was 1,193,800.

Handicap of Rates.

In November last, the National Union of Manufacturers wrote to the Minister of Health suggesting that, in view of the increasing burden of local rates, a Royal Commission should be set up, with comprehensive terms of reference, to supplement the limited inquiry of the Earl of Onslow's Commission into the relations between the different local bodies. At that time the Minister stated that he did not consider a case had been made out for the proposal. The members of the Union, however, with their widespread knowledge, as manufacturers, of the burden of the rates, are not prepared to leave the matter at that. They have again written to the Minister to the effect that there is abundant evidence that the burden of rates on manufacturers has in recent years increased in special degree. They also ask the question: "Is the Government prepared to acquiesce in the continuance of increases in public expenditure, which, if not checked, will eventually dry up the earnings of industry, from which alone they can be met, or is it their intention, while there is yet time, to take effective steps to secure a reasonable measure of economy in Imperial and local expenditure?"

Railways and Road Transport.

Considerable trouble seems to be developing over the Road Transport Bills which the railway companies have deposited in Parliament to confer upon them road transport powers. The House of Commons will be the scene of the first discussion; and it is anticipated that a verdict on the principle for which the Companies are contending will be given on one of the measures—probably that of the L.M. & S. Railway. In connection with these Bills, it is interesting to note how the affairs of one industry may so affect other industries as to make it impossible for a workable combination of all trade unions, as has often been proposed. The Railway Companies' Bills, for example, are receiving the backing of all the railway trade unions, who naturally want the companies to become as prosperous as possible, as this would be in the interests of the employees. On the other hand, the Transport Workers' Union are strongly opposed to the new powers being granted to the railway companies; and the Unions are, therefore, presenting a petition against the measures which will give them the right to appear by Counsel before the Select Committee. We notice an interesting letter in the "Birmingham Post" from Mr. F. Ballard, Chairman of the Herefordshire County Council. He says that the Railway Bills require the very close attention of all public authorities and owners of vehicles. Among his points are: "Everybody is affected by railway rates; they are a charge on every loaf of bread we eat. When high, they add materially to the high cost of living, and mean dearer coal, gas, and coke." As our readers are aware, the National Gas Council are unceasing in their efforts to bring down the rates for the conveyance of the material needed by the gas industry and of the secondary products it makes. We may be sure that the Council during the coming session will have the Railway Bills under constant surveillance

Engineering Wages.

In the engineering industry there are no less than 28 trade unions. At the national conference last Thursday, they had under consideration the question of an application to the Engineering Employers' Association for wage increases. The decision was to ask for an advance of 8s. per week. This resolution over-rides the demand of the London Joint Trades Committee for 20s. weekly, as well as other district demands of a similar nature. The negotiations, which will be on a national scale, as will also be the result, will open some time this month. The Employers' Federation have been asked to meet the Unions in joint conference to consider the demand.

BOOMING THE COKE BOILER.

A Hire-Purchase Scheme.

In most industries there is to be found the "big brother"—a firm of outstanding magnitude and resources, or a combination of firms—who bears the cost of publicity or research on a scale beyond the reach of the small man, however important his individual contribution may be, and often is.

The gas industry and its several subsidiaries, the makers of gas and coke fired apparatus, are no exception. Thus the National Radiator Company, acknowledged to be the largest individual makers of coke-fired boilers, announced in a page advertisement in the "Daily Mail," on Jan. 26, their scheme for installing independent domestic hot-water supply and central heating boilers on the hire-purchase plan.

This scheme has been aptly described as an ideal investment; and it would indeed be difficult to imagine a more lucrative investment for the house owner, fruitful in comfort and convenience, and labour-saving, as well as a means to economy in fuel cost; while the enhancement in value that accrues to a house so equipped needs no emphasis. The scheme includes an arrangement to reimburse the builder or hot water fitter on the satisfactory completion of the job; the Company collecting 25 p.ct. of the cost from the house owner, and the remainder in twelve monthly instalments. This application of the hire-purchase system to coke boiler installations immediately makes every house owner a prospective user of coke, thereby extending the most desirable of all markets for the chief bye-product of the gas industry.

Regarded, as it must be, as a complementary and supplementary adjunct to the gas cooker, the coke boiler ranks in importance second to none as a piece of "gas" apparatus; and enterprise in popularizing its use on the far-reaching scale adopted by the National Radiator Company warrants the unstinted support of all concerned.

PERSONAL.

It is with deep regret, which will be widely shared in professional gas circles, that we learn of a distressing accident to Mrs. MADDEN, wife of the President of the Institution of Gas Engineers (Mr. H. D. Madden, M.Inst.C.E.). She was knocked down by a motor cycle on Monday of last week, and was injured; but favourable progress is being made on the road to recovery. Sincere sympathy with her and the President will flow from their many friends in the industry.

Mr. S. J. INGRAM has resigned his position as Engineer to the Truro Gas Company after a period of 33 years' service with the Company, and the Directors have appointed his son, Mr. L. P. INGRAM, M.Sc., A.I.C., who for the past four years has held the position of Assistant Engineer, to succeed his father as the Company's Engineer. Mr. S. J. Ingram retains his position of Managing Director, and will be responsible for the general management of the undertaking as before.

Mr. W. N. BATTERSBY, Assistant Engineer and Manager to the Kendal Corporation Gas and Water Department, has been appointed Engineer and Manager of the Ambleside Urban District Council Gas and Water Department.

Mr. COLIN ROBSON, of the Engineer's staff of the Newcastle-on-Tyne and Gateshead Gas Company, has been appointed Assistant Superintendent of Works to the Primitiva Gas Company at their Buenos Aires Station. Mr. Robson takes up his duties very shortly.

Mr. J. S. NAYLOR, who has just retired from the position of Engineer and Manager of the Rotherham Corporation Gas-Works, after 22 years' service, has been presented with a silver salver subscribed for by the employees.

The Cannock, Hednesford, and District Gas Company, Ltd., have appointed Mr. W. C. STEWART as an assistant, under Mr. G. H. Stewart, the Engineer and Manager. Mr. W. C. Stewart was a pupil under Mr. W. G. S. Cranmer (the Engineer and Manager of the Willenhall Gas Company) for four years, during the last two of which he acted as technical assistant.

Mr. WALTER T. DUNN, Secretary of the Institution of Gas Engineers, asks us to say that he and his family deeply appreciate the many expressions of sympathy which they have received from their friends in the gas industry in their very severe bereavement.

Among the recently elected Members of the Institution of Chemical Engineers is the name of Mr. H. C. HEAD, M.Inst.C.E., M.I.Mech.E., Engineer and General Manager of the Winchester Water and Gas Company. Mr. C. C. CHALLIS, A.S.T.C., Chemical Engineer at the Bye-Products Works of the Australian Gaslight Company, Sydney, has been elected an Associate Member.

Mr. WALTER HOLE, Organizing Secretary of the Institution of Gas Engineers' Education Scheme, has been unanimously elected President of the Yorkshire Society of Torquay and District, which has a membership of about 150.

OBITUARY.

We regret to report the death of Mr. JOHN T. BATTERSBY, for thirty years the Engineer and Manager of the Ambleside Urban District Council Gas and Water Department.

We regret to record the death, at the age of 70, under most tragic circumstances, of Mr. FREDERICK NORTH, who occupied a seat on the Board of Directors of the Nuneaton Gas Company, the Wolverhampton Gas Company, and other similar undertakings. He resided at Holly Lodge, Stourbridge, and left home on the morning of Jan. 27 to attend a meeting of Directors of the Nuneaton Gas Company. His co-Directors noticed nothing unusual in his condition—in fact, he seemed better in health than usual—but it was known that he had suffered from heart trouble. He left the meeting to catch a certain train, and when a quarter-of-a-mile from the railway station was seen to reel, and then fall to the pavement. A doctor was at once summoned, but could only pronounce life extinct. Information of the sad event was conveyed to the Gas Company Directors, who were still sitting, and was received by Alderman R. W. Swinnerton (Chairman) and his co-Directors and the officials with the greatest regret. Mr. North might be described as having been an enthusiast in all matters relating to gas production. In his younger days, he was Gas Engineer at Para, South America, and about 35 years since returned to this country to become associated with the firm of Messrs. Parkinson & Cowan. He leaves a widow and grown-up family. At the inquest at Nuneaton, on Saturday night, a verdict of " Death from valvular heart disease " was returned.

ELECTRICITY SUPPLY MEMORANDA.

THE Central Electricity Board and the Electricity Commissioners are not finding their positions exactly beds of roses. It would be humanly impossible for them to please everyone; but they seem to be in the unfortunate position of being able to gratify only the few. From all sorts of unexpected quarters the hand and voice of man are being raised against them and their doings; and, if we heeded all that was said, the only conclusion would be that the Board and the Commissioners are composed of nincompoops of the first water. For the information of those who do not know these gentlemen, it may be said that any such conclusion would be an error. However, we do not envy them their jobs. The local authorities in the large area comprised within the South-Eastern scheme have protested and petitioned against it, and privately and publicly have said all manner of evil regarding it, largely because they are disappointed with the station selections that have been made. In their opinion, the Commissioners could have been much better than they have, and the scheme altogether is an unhealthy one. Many of the local authorities would rather be left alone than be driven into the scheme as framed by the Commissioners. But there is no hope of their escaping. For better or for worse, legislation has wedded them to the plans of the Commissioners, if approved by the Central Electricity Board. And the Board, it is expected, will, with the greatest of magnanimity, endorse the scheme of their colleagues.

Discomfort for the Central Authorities.

Now the London public have become rebellious. Among them the belief has been awakened that the enormous super-power stations that are to be constructed at Chiswick and Battersea are potential enemies of the amenities of London. They will each use thousands of tons of coal a year. They will belch forth enormous volumes of smoke and grit, carbon dioxide, and sulphur dioxide—polluting the air, impairing health, and destroying the fabrics of our cherished buildings. Kensington is sick at the very thought of it all; and the Borough Council have expressed strong views upon it. Of course, there would be very bad boiler-house working if all was done that is predicted. However, the objectors are of opinion the stations should be removed farther afield, and the current from them be brought in by cable. We see no reason why these mammoth stations should not be located away from London. The huge Beckton Gas-Works were built away from the densely populated parts of London. But the Electricity Commissioners have their eyes on the reduction of transmission costs for the output of these stations. Those who would prefer a source of pollution and producer of noxious fumes to be taken to a more distant place are suavely told that the builders of these generating-stations have been informed that they must resort to the best known precautions for the due consumption of smoke, and for preventing as far as is reasonably practicable the evolution of noxious fumes. The " best known precautions " and " reasonably practicable " are eloquent of the fact that there are no known and practicable means for the complete suppression of nuisance by such stations. Technical opinion asserts that there is no necessity for locating the stations—the Battersea one is particularly the object of aversion—so near the heart of London. The Electricity Board aver that they have not yet confirmed the recommendations of the Commissioners. But is anyone prepared to make himself an object of derision by declaring that the Board will not do so? We rather thought the 1926 Act of Parliament would not settle all things. It has not composed public opinion, and it has not turned the municipal authorities from the belief that they can do as well as, if not better than, this consolidating scheme in supplying cheap electricity.

Public Alarm.

The Schemes.

The Central Electricity Board were adamant in respect of the appeal made to them that the South-Eastern Scheme should be the subject of public inquiry. It is, however, hinted that the Board have privately heard " all " representations from parties interested in the scheme; and it is expected that an announcement is at hand that the Board have adopted it. One of the most unlikely things would be to hear that they had not done so. It is thought that some time in March the Commissioners will be able to send to the Board their plans for the third scheme—that for Central England. As to the Scottish scheme, tenders for the transformer stations have been received. The programme of the Board in connection with this scheme contemplates that the first section of the overhead transmission system will be completed by Dec. 31 next. That section, 13 miles in length, will run between Clyde's Mill and Yoker *via* Dalmarnock and Port Dundas. The work for the

erection of the steel towers will start some time in April. The scheme comprises 228 miles of overhead transmission lines, and approximately 1530 steel towers will be required. For the double circuit in the Glasgow ring, the towers will be 78 ft. high, and for the single circuit 66 ft. high. The cable span will be about 900 ft., or approximately six to the mile. It is probable that both the Forth and the Tay will be crossed by single spans; the longest of which will be about 1½ miles. In order to allow for the sag in the cable, and to give sufficient clearance for passing vessels, it is expected that towers 300 ft. high will be erected.

Rural Supply Uneconomical.

We all recollect with some amusement the statements made when the Electricity Supply Bill (now the Act of 1926) was introduced to the people. It was going to transfer the most isolated patch of the country into a little paradise, and give to Hodge the means for lighting, heating, and housework generally at a fabulously low price. How the ideas of our political electrical experts have changed since those days! The conversion began when they had the measure safely lodged in the Statute Book. The Minister of Transport (Colonel the Rt. Hon. Wilfrid Ashley) was speaking recently at the annual dinner of the Electrical Contractors' Association. In the course of his remarks, these passages occur: "Urban needs would be adequately looked after by the Central Electricity Board. But at the present time the desire of the rural areas for electrical development could not be really satisfied; for the simple reason that in most rural areas it was not a commercial proposition. Neither electrical undertakings nor municipalities were philanthropic organizations; and they must proceed on commercial lines." At the same time Col. Ashley has not abandoned hope that it will be possible to make it a commercial proposition. That is more sensible than the idle talk of a couple of years ago. But, strange to say, it has escaped our notice that the rural areas have shown any great yearning for electrical development; what we have observed is that they have protested against the disfiguring of their surroundings by steel towers and overhead cables. They have also a feeling that the current could not be supplied to them at a cost to suit the modest contents of their pockets.

Doubtful Authenticity.

We are inclined to doubt the authenticity of a figure which has given the name of Hugh Quigley, Chief Economist of the British Electrical and Allied Manufacturers' Association, great prominence during the past week or two. He asserts there was a 25 p.ct. increase of electricity in 1927—that is, compared with 1926, when there was only a 3 p.ct. increase. Of course, 1926 was not at its best for industrial consumption; and so, if the 25 p.ct. is correct, it may be largely constituted of revived power business—in fact, Mr. Quigley says industry consumes 70 p.ct. of the electricity output. But is the 25 p.ct. guesswork or a computation from actual returns obtained direct from all the undertakings? January was not far spent when the figure was published, so that we have disturbed feelings as to its being the product of positive information. We shall be interested in comparing it with the Electricity Commissioners' report for 1927 when it is available. Mr. Quigley also tries to make electrical flesh creep by his prediction that the majority of power stations in this country will find themselves at the end of this year unable to cope with the demand for electricity. "At the present moment there is less than 100,000 KW. of reserve plant in the London area, and in the event of a serious breakdown—and this might occur at any time during the next year—London would be plunged in darkness." But what about all that existing reserve plant the saving of which the Electricity Commissioners are placing to the credit of the new scheme? According to Mr. Quigley, it is non-existent. However, no part of London will be "plunged in darkness" where gas is installed for lighting.

Economizing.

When the Hastings Board of Guardians adopted electric lighting, it was said that a great economy would be achieved. That is always stated when any local authority wish to transfer their custom from gas supplied by a company to electricity supplied by a municipal undertaking. At a recent meeting of the Hastings Board of Guardians, the Finance Committee reported on the steps taken to reduce the consumption of electricity for lighting. Every employee, it was said, is to receive a typewritten slip urging him or her to exercise the greatest care in the consumption of light. This would not be done without a cause. We will not ask its nature.

Mishaps.

Boys will be boys. William E. Chapman, aged 13, son of a colliery deputy of Doncaster, was electrocuted through playing with a piece of loose wire which came into contact with an overhead cable. Evidence given at the inquest by Mr. E. M. Fox, chief electrician at Bentley Colliery, was partly in the nature of a theory as to what occurred. Last Sunday week an electric cable from the colliery which conveys power to the pumping station broke. In repairing it, the electrician put in a temporary guard wire, and fastened a coil of wire at the foot of one of the poles. Later it was found that the support holding this wire had been removed. It is thought that the boy caught hold of the loose wire and swung on it, causing the guard wire between the pole and the next one to snap, and come into contact with the power cable. A verdict of "Death from misadventure" was returned. The Coroner made the suggestion that schools should give instruction on the dangers of electricity. Smoke was seen issuing from the roof of St. George's Church, Llandudno, on the night of Jan. 20. The Fire Brigade found the ceiling and the beams well alight, and before the firemen could get to work the vestry roof had been demolished. The reporter states that the fusing of an electric wire is "believed" to have been the cause of the outbreak. Tut, tut. Such statements are to our electrical contemporaries like a red rag to a bull. Lincoln suffered a collapse of its electricity supply on the 26th ult. The usual report: Candles requisitioned, cinema performances interrupted, special police to direct street traffic. Talybont is evidently supplied with current by overhead cables, as a report published on Jan. 27 says the mains were damaged during a gale, and the lights in houses and other places were extinguished. A dance in the Memorial Hall was continued by candle light. A local paper says a coincidence occurred in the assembly room of the members of the Lincoln Engineering Society, who were giving an official welcome to their new President, who is the City Electrical Engineer. At the height of the ceremony, the lights were suddenly extinguished; and in the darkness the President vanished while the proceedings, when candle light was arranged, were carried on without its head.

EFFECT OF LIGHTING ON OUTPUT.

Research of the Industrial Fatigue Research Board and the Illumination Research Committee.

A Joint Report of the Industrial Fatigue Research Board and the Illumination Research Committee on "The Effect of Different Systems of Lighting on Output and Accuracy in Fine Work (Typesetting by Hand)," by H. C. Weston and A. K. Taylor, which investigation was carried out under the auspices of the Medical Research Council and the Department of Scientific and Industrial Research, has been published by H.M. Stationery Office, Adastral House, Kingsway, W.C. 2, at 4d. net.

In a previous report on the same subject (published last year) were embodied the results of an investigation into the optimum illumination required for typesetting. In this it was suggested that, with a system of direct lighting, output does not reach its maximum value till an illumination of 20 foot-candles is attained. No attention was then paid to the system of lighting tending to give the best results; and it was decided to study the effects of different installations in common use; the actual illumination being kept constant at 10 foot-candles. The results of this investigation are set forth in the present report.

It is shown that local lighting—a system in common use—is inferior to either direct general or semi-indirect lighting, and that this inferiority is accentuated whenever glare from the light source is present. This conclusion is based on data obtained from six compositors only; but it is noteworthy that all the results were consistent, and pointed in the same direction.

In some composing rooms, it is stated, general lighting may be unsuitable on account of structural features, which will prevent the elimination of undesirable shadows. In such cases, a combination of general and local lighting, in which the two types of source give approximately the same illumination, is recommended.

The observation is made that totally indirect lighting involves a loss of output, but has the advantage of reducing reflected glare from the type. There is evidence that the colour of the light used in composing rooms may be of some importance in relation to the question of glare. Sufficient work, however, has not been done on this aspect of the problem to enable definite conclusions to be drawn.

MIDLAND ASSOCIATION JUBILEE.

Celebration Dinner in Birmingham.

The first ordinary meeting having been held on Jan. 10, 1878, the Midland Association of Gas Engineers and Managers have now reached their Jubilee; and right royally did they celebrate the occasion on Thursday evening, Jan. 26, by a dinner, dance, and cabaret show in the Queen's Hotel, Birmingham.

The idea was a good one, for it involved the inclusion of the ladies, and thus brought into the proceedings greater pleasure than could in any other way have been secured. The evening was a delightful one, and all present felt deeply grateful to the jubilee, and to those responsible for the arrangements, for having brought about the function. One gathered from remarks made that it has taken the Association fifty years to develop thus the social side, but the guess may be hazarded that it will not require another half-century to bring about a repetition of so happy and helpful a gathering. And why should it? The officers of the Association have shown that they know how to arrange for an excellent dinner, and where to seek the most charming and talented of cabaret performers, together with the most untiring of musicians; while the members have demonstrated that dancing is by no means the least of their attainments. As for the ladies, they obviously enjoyed themselves thoroughly. The President (Mr. Francis C. Briggs, Assoc.M.Inst.C.E., of Dudley) has had the matter greatly at heart, and is, along with the Hon. Secretary (Mr. T. Thornton) and others responsible, deserving of warm congratulation.

After a reception by Mr. and Mrs. Briggs, a party of about 140 sat down to dinner; the President, who was in the chair, being supported at the top table by Mr. H. D. Madden, of Cardiff (President of the Institution of Gas Engineers), Mr. W. G. S. Cranmer, of Willenhall (President-Elect of the Midland Association), Mr. J. Ferguson Bell, of Derby (a Past-President), and Mr. Thornton. A number of gentlemen were present who had been members of the Association for very many years.

The Loyal Toast having been honoured at the call of the CHAIRMAN,

THE ASSOCIATION.

Mr. MADDEN said that he had been asked to propose the toast of "The Midland Association of Gas Engineers and Managers," and it gave him the greatest possible pleasure to do so. He was glad of the opportunity of congratulating the Association upon the attainment of their jubilee; and when he was leaving South Wales, Mr. Octavius Thomas had asked him to convey his congratulations also. Another reason why he was pleased to propose this toast was because of their President, Mr. Briggs. Like himself, Mr. Briggs was a Beckton man; and among those who had served at Beckton, there was a strong feeling of brotherhood. Quite recently, in the course of conversation, one of the Chiefs of the Gas Light and Coke Company had highly commended their President. He said: "I think young Briggs will go far." He (Mr. Madden) hoped, and believed, he would. ["Hear, hear."] He knew his record, and what this old Chief of his had said confirmed his own view.

BIRMINGHAM AND THE GAS INDUSTRY.

He would remind them that in this district, within the past half-century or so, some of the giants of the gas industry had been trained. To mention only a few names, there were Mr. Charles Hunt, Mr. Henry Hack, Mr. Henry Woodall, Mr. R. O. Paterson, and Mr. Thomas Glover. These were names which for many years had been an inspiration to the younger members of the industry. In this district, too, Murdoch had lived, and had done so much work in connection with gas lighting. He would not say that Murdoch was the first in the field in this matter, because South Wales claimed the honour. Though he was not a Welshman, except by adoption, he must mention this fact. Llandaff, where they claimed that gas was first made—*i.e.*, in the middle of the seventeenth century, by the then Bishop of Llandaff—was now incorporated in Cardiff, which he hoped many of those present would see next June. It was one of the beauty spots of South Wales.

AN ERA OF PROGRESS.

Very much had been accomplished during the half-century of the Association's existence—a period which had witnessed the rise of electrical competition. In this district the Association were looking after the welfare of the industry and fostering research long before the National Gas Council and the British Commercial Gas Association came into existence. Now, in addition to the Institution of Gas Engineers, they were fortunate enough to have these two great national organizations to help them. The gas industry had still vast possibilities to explore. Under the stimulating effects of electrical competition, the output of gas had become vastly greater than when electricity first came along. There would always be electricity, which had its own particular uses; but nevertheless the gas industry was increasing its business year by year, and in every direction. Birmingham itself had set an example to the country in the utilization of gas for industrial purposes. While electricity would progress in its own particular fields, it could not hope successfully to invade those spheres which essentially belonged to gas.

RESEARCH AND EDUCATION.

The Institution of Gas Engineers, with whom they were incorporated, were carrying out research work as far as possible. They could spend a lot more money if they could get it; but they had to do what they could with the amount forthcoming. The Education Scheme of the Institution was now in its fifth year; and it had been hoped that Mr. Briggs would have taken a place on the Board of Examiners. Unfortunately, however, he could not this year see his way to accept the position. A great deal of work had been done under this scheme, not only in connection with the provision of properly qualified technical men, but on the distribution side—the fitters and the salesmen. They must give more attention to the latter branch, because it was necessary that the men who went among the consumers should have a thorough knowledge of gas and its applications. It did appear to him that the activities of the industry required to be made better known to the public. It should be made known to them that from 75 to 80 p.ct. of the energy in the coal that went into gas-works was delivered to consumers in one form or another, and that this compared with an anticipated 20 p.ct. efficiency in the case of the super-electrical stations. He himself had lately had some experience with gas lighting, about which more would probably be heard through the medium of the Technical Press. Within a few months, some 760 housing estate tenants had reverted from electricity to gas lighting. The working classes appreciated gas lighting because it gave them also warmth in their living rooms. He hoped the Association would continue to prosper, and that when the new rules (in which, again, their President had helped so much) for widening the membership of the Institution came before them as a

[*Photo. by Ernest H. & H. E. Fletcher, Moseley, Birmingham.*

FIFTIETH ANNIVERSARY DINNER OF THE MIDLAND ASSOCIATION.

[*Photo. by Ernest H. & H. E. Fletcher, Moseley, Birmingham.*

GROUP OF PAST-PRESIDENTS WHO ATTENDED TO RECEIVE THEIR MEDALS, with the Hon. Secretary (wearing Rosette).

District Association, they would support Mr. Briggs in what he had done.

APOLOGIES.

The CHAIRMAN, in response, said that certainly he had never before had so pleasurable a duty as that of presiding over the present gathering. Unfortunately, many who would otherwise have been with them had been unable to come. Mr. Neville Chamberlain, whose father had been so closely associated with the Birmingham gas undertaking, would have been glad on many grounds to accept the invitation; but other arrangements made it impossible. Sir David Milne-Watson wrote:

> Thank you very much for your kind invitation to the jubilee dinner of the Midland Association of Gas Engineers and Managers on the 26th of January. I should have liked very much to be able to come; but I much regret that it will not be possible for me to come to Birmingham that day. I sincerely hope your jubilee gathering will be a great success.
>
> D. MILNE-WATSON.

They had also wished to have with them Alderman J. H. Lloyd, the Chairman of the Birmingham Corporation Gas Committee, who had written:

> After the very long invitation you gave me to attend your Midland Association dinner on the 26th, I am annoyed to find that my colleagues have fixed that very day for a series of Board and Committee meetings in London, from which I cannot absent myself, so shall be prevented from joining your party.
>
> Please accept my apologies, and forgive me.
>
> JOHN H. LLOYD.

The absence of Mr. Walter Dunn (Secretary of the Institution of Gas Engineers) was due to the death of his wife; and doubtless it would be the wish of those present that the Secretary of the Association should send him their condolences. On the other hand, they were particularly fortunate in having with them Mr. H. D. Madden, who, as President of the Institution, had done them a great honour in coming to their celebration. Especially would they all appreciate his presence when they learned that only a few days previously Mrs. Madden had met with a severe accident in Cardiff—having been knocked down by a motor cycle which had skidded. They extended their deep sympathy, coupled with the hope that Mrs. Madden would very soon fully recover.

REMINISCENCE.

So far as he could trace, the Association had never before this had a social gathering, though just over fifty years old. Glancing over the first minute book, it appeared that the Association owed its origin to a meeting held at the Windsor Street Gas-Works, Birmingham, to consider the desirability of forming a District Association of Gas Managers. There were present Mr. Charles Hunt (Birmingham), Mr. John Annan (Wolverhampton), Mr. Thomas Collett (Dudley), Mr. William North (Stourbridge), and Mr. John Tindall (Walsall). A month later there was another meeting for the purpose of forming such an Association; and this was attended by the gentlemen already named and others—including Mr. D. Lee (Willenhall) and Mr. J. S. Cranmer (Stratford-on-Avon). In view of this, it might be thought fitting that, on the occasion of the jubilee dinner, the President should come from Dudley, and the President-Elect should be the son of one of the original Committee members, and hail from Willenhall. The first ordinary general meeting took place in the Midland Hotel, Birmingham, on Jan. 10, 1878, when there were twenty members present. It was, of course, formed as a Technical Association; but it was curious to note how soon commercial matters crept in. The problems discussed in those early days appeared largely to be the problems with which the industry was faced to-day. For example, differential rates of charge, the advisability of sending out monthly accounts, and the abnormal price of coal. One early entry read as though it might have been written yesterday. Someone had expounded a new process of carbonization which looked as though it were going to perform wonders. A Committee was formed; but owing to the fact that no facilities were afforded for investigation, it was disbanded. [Laughter.] Then there was a conversational discussion on the effect produced upon the illuminating power of gas by the admission of small quantities of air in the course of purification. The conversation proved very interesting; but it was agreed that no report of the proceedings should be taken. The Secretary evidently had his own particular troubles then, as now. It was stated that one meeting was remarkable for two things—the largeness of the attendance, and the fact that the whole of the members present and absent (with the exception of four) had replied to the Secretary before the day of the meeting. Again, "the first item on the agenda (payment of subscriptions) was rapidly disposed of more or less, but rather less than more."

He might remind them that the "Birmingham Medal" was really instituted by the Midland Association. It arose from a meeting held at Rugby as long ago as 1880; the object being to encourage original research. It was Mr. Hunt who first formed the idea, and laid it before the Association, with the result that a fund was subscribed. This was a fact of which he thought they had reason to feel proud. The Education Scheme in which they all now took so great an interest had, as far as one could judge, its origin in the Midlands; for some forty years ago steps were taken to see whether classes could not be formed in gas manufacture; and after a little trouble they were started in Birmingham.

PRESIDENTIAL SOUVENIRS.

At the last autumn general meeting of the Association, it had been decided that a presentation should be made to Past-Presidents, to take the form of an engraved silver-gilt medal, with a ribbon and brooch, and a bar for each year of office; and it was arranged that the ceremony of presenting these medals should take place at the jubilee celebration. Coming to this portion of the proceedings,

The CHAIRMAN remarked that the greatest pleasure in life was a store of happy memories; and there was no happier memory than that of a very difficult task faced bravely and carried through successfully. The Association's Past-Presidents were Trojans of the industry, and they had filled the position for the good of the industry. They wanted no recompense. But to mark the jubilee, the Committee had thought it fitting to institute a medal which would serve to remind those who had passed through the chair of the work they had done during their year of office. On looking down the list, the first name that caught one's eye was that of Mr. Charles Hunt, who had been President for three years. He was the first President, and did

everything in his power to help the Association. Unhappily, his advanced age and the state of his health rendered it impossible for him to be with them that evening; but certainly the memento would give him pleasure, and remind him of the many pleasant days he had spent among them. Some other Past-Presidents, of course, were also absent for similar reasons, while still others were kept away by distance. A letter in the following terms had been received from Mr. John Young, of Hull:

> I should have been very pleased to join in the celebration of the fiftieth year of our existence. Many happy meetings have I had the privilege of attending, and surely this will be a particularly happy one; but unfortunately I shall not be in England on the day that the celebration takes place.
>
> I am very much afraid that I am approaching the position of senior Past-President, and probably am not known to the majority of your present members. But I should be glad if you would convey to all my best wishes for the future, and to all my old friends my grateful thanks for the many kindnesses I have received from them.
>
> It has been a matter of regret to me that I have not been able to attend any of your meetings for a long time; but I have followed the reports of your proceedings with great interest, and am pleased to note that the fine traditions of the "Midland" are carried on. Such men as Messrs. Hunt, Hack, and Paterson were giants in their day; and the present members of the "Midland" are worthy successors to the heritage left by them. They seem to realize that the very best they can give is their bounden duty; and they give of their best ungrudgingly.
>
> I am sure you will have a very happy meeting on Jan. 26, and am very sorry that I shall not be able to be with you.
>
> JOHN YOUNG.

Mr. C. H. Carder, of Rio de Janeiro, wrote:

> Please accept my heartiest congratulations on the jubilee of the Midland Gas Association, which occurs this year under your Presidency. I trust that you will have a most successful reunion on the 26th inst. to commemorate the event.
>
> The Association may justly be proud of the record which it has for services performed for the advancement of the gas industry, and for the high level of the papers presented at its meetings, and has certainly not lost anything of its former lustre from the very admirable manner in which you have controlled its destinies. To my congratulations on the past record and present position of the Association, I would add the most sincere good wishes for its continuous prosperity and usefulness in the future.
>
> I am sorry I shall not be able to join you on the 26th; but while you are more or less enjoying the terrible weather which, according to the information we get here, you have been experiencing almost continuously since Christmas Day, it may be some consolation to you to know that we are enjoying uninterrupted sunshine, with a shade temperature at the moment of 95° Fahr. and the sun temperature something over 120°, while the bathing is delightful.
>
> C. H. CARDER (Rio de Janeiro).

At the last moment, Mr. C. H. Webb, of Stourbridge, and Mr. Hubert Pooley, of Leicester, had been prevented from coming, so that there were only twelve recipients of the medal present. He would ask Mr. J. Ferguson Bell, one of the oldest Past-Presidents and best-known gas engineers in the kingdom, and a Past-President of the Institution of Gas Engineers, to reply on behalf of them all.

PAST-PRESIDENTS PRESENT.

The following Past-Presidents were then presented with their medals:

1898.—Mr. J. T. Lewis, Wellingborough.
1900.—Mr. J. F. Bell, Stafford.
1908.—Mr. H. E. Copp, West Bromwich.
1910.—Mr. Vincent Hughes, Smethwick.
1911.—Mr. J. H. Brown, Nottingham.
1913.—Mr. W. S. Morland, Gloucester.
1917.—Mr. G. Stevenson, Long Eaton.
1920.—Mr. J. R. Duff, Banbury.
1921.—Mr. J. Paterson, Cheltenham.
1922.—Mr. W. H. Adams, Bilston.
1923.—Mr. P. N. Langford, Coventry.
1926-7.—Mr. F. C. Briggs, Dudley.

GLANCING BACK.

Mr. J. F. BELL said he regarded it as a real privilege to reply on behalf of all the surviving Past-Presidents of the Association. During the half-century they had had 43 Presidents—in more than one instance the same gentleman occupying the chair for a longer period than one year. All of these gentlemen he had been privileged to know—several as much-esteemed personal friends. No fewer than 18 of their Past-Presidents had died, and to one or two of them he would like briefly to refer. Many were called upon to occupy prominent positions, and all added in various ways their quota towards the advancement of the industry. He called to mind his valued friend the late Mr. R. O. Paterson, of Cheltenham, who was three times President; and also his close personal friend the late Mr. Thomas Berridge, who was never weary of helping others. And so he might continue to speak in felicitous terms of all those 18 Past-Presidents whose work on this earth was finished. It gladdened their jubilee celebration to know that the first President, Mr. Charles Hunt, was still with them—the only regret being that, owing to impaired health, he was unable to be present to reply for the surviving Past-Presidents. For many years Mr. Hunt was the recognized leader in the Midlands. He was three times President of their Association; and those who had the advantage of knowing him would agree that he worthily upheld the best traditions of the industry. He was instrumental in forming the Association, whose interests he did everything in his power to foster; and he was a leader of whom they all felt proud. Another outstanding engineer to whom he would like to refer was Mr. Henry Woodall, who was President as far back as 1883. The name of Woodall in the gas industry was an honoured one; and he, along with his distinguished brother, the late Sir Corbet Woodall, did much for its advancement in the best sense of the word. On behalf of himself and all the other Past-Presidents, he returned thanks for the medal, which would be highly prized, and serve to recall many happy memories. It was their earnest wish that the Association should continue to prosper. Many years of observation had convinced him of the value and importance of such organizations.

MAGNITUDE OF THE INDUSTRY.

The magnitude of the industry in which the members were engaged was indicated by the latest Board of Trade returns, relating to all authorized gas undertakings in Great Britain belonging to companies and local authorities for the year 1926. It was shown that the capital invested in the gas industry amounted to no less than £179,999,999. The revenue for 1926 was £74,701,868, and the expenditure £66,972,747, the profit being £7,729,121. The coal carbonized was 16½ million tons, and the gas sold 276,568 million c.ft. The consumers served numbered nearly 8½ millions. These figures indicated the immensity of one of the most important public services, which had practically become a necessity of modern civilization. It was the ambition of all engaged in the gas industry to find as many users as possible for town gas; and the figures quoted indicated how enormously successful the efforts had been. These facts contradicted the statement sometimes put forward by people who did not know anything about the matter, that gas had reached its zenith. The gas industry was never more prosperous or doing greater work than was the case to-day. This growth, he was convinced, would continue.

OPENING THE DOOR WIDER.

Now that the Midland Association had reached fifty years of age, he was glad to hear that the question of enlarging its boundaries had been taken into consideration, so that they might include not only those who were employed as gas engineers, but also those chiefs of large industries who were qualified to assist the Association in its work.

FORTHCOMING ENGAGEMENTS.

[*Secretaries of Gas and Kindred Organizations are asked to assist in making this diary of events as complete and useful as possible by sending the earliest intimation of all meetings.*]

Feb. 4.—WALES AND MONMOUTHSHIRE JUNIOR GAS ASSOCIATION.—Meeting in Cardiff. Paper by Mr. C. S. Thane on "Some Mechanical Operations on a Gas-Works."

Feb. 4.—WESTERN JUNIOR GAS ASSOCIATION.—Meeting. Address by Mr. Thomas Hardie, and paper by Dr. E. W. Smith on "Modern Tendencies in Carbonizing Practice."

Feb. 11.—LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.—Visit to the works of the Sutton Gas Company.

Feb. 11.—MIDLAND JUNIOR GAS ASSOCIATION.—Visit to the Windsor Street Gas-Works, Birmingham.

Feb. 11.—SCOTTISH JUNIOR GAS ASSOCIATION (EASTERN DISTRICT).—Visit to the Burntisland Gas-Works and the Pettycur Bottle Works, Kinghorn.

Feb. 11.—SCOTTISH JUNIOR GAS ASSOCIATION (WESTERN DISTRICT).—Meeting in the Royal Technical College, Glasgow. Paper by Mr. W. Scott, of Glasgow, on the "Control of Calorific Value."

Feb. 14.—NATIONAL GAS COUNCIL.—Meeting of the Central Executive Board.

Feb. 14.—FEDERATION OF GAS EMPLOYERS.—Meeting of the Central Committee.

Feb. 16.—MIDLAND JUNIOR GAS ASSOCIATION.—Meeting. Paper by Mr. J. W. Wood, M.Sc., on "Aeration."

Feb. 20-March 2.—BRITISH INDUSTRIES FAIR.—Birmingham and London.

Feb. 21-24.—CARBONIZATION CONFERENCE.—Midland Institute, Birmingham.

Feb. 22.—MANCHESTER AND DISTRICT JUNIOR GAS ASSOCIATION.—Joint meeting with YORKSHIRE JUNIOR GAS ASSOCIATION. Visit to the works of the National Gas Engine Company, Ltd., Ashton-under-Lyne. Paper by Mr. W. P. Smith, B.Sc., of Bolton, on "Gas-Works Effluent."

Feb. 22.—BRITISH COMMERCIAL GAS ASSOCIATION.—Meeting of the General Committee in Birmingham.

Feb. 24.—LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.—Meeting at the Westminster Technical Institute, 7.30. Paper by Mr. H. J. Escreet, B.Sc., of the Gas Light and Coke Company: "Notes on the Laying of Gas Mains of Large Diameter."

Feb. 25.—SCOTTISH JUNIOR GAS ASSOCIATION (WESTERN DISTRICT).—Visit to the Works of Messrs. Walter McGee & Sons, Ltd., Paisley.

March 2.—"B.C.G.A." INDUSTRIAL SALESMEN'S CIRCLE.—Meeting in Birmingham.

INSTITUTION OF GAS ENGINEERS.

Feb. 13.—Revision of Articles of Association Committee. Emergency Committee. Finance Committee. Benevolent Fund Committee of Management. Council Meeting.

Feb. 14.—Executive Committee of Gas Education Committee.

June 12-15.—Annual General Meeting at Cardiff.

CARBONIZATION CONFERENCE, BIRMINGHAM.

We have received from Dr. E W. Smith, the Hon. Secretary of the Joint Fuel Committee of the Institution of Gas Engineers, the Coke Oven Managers' Association, the Society of Chemical Industry, and the Institute of Fuel, the programme of the Carbonization Conference which is to be held in the Birmingham and Midland Institute and the Queen's College, Paradise Street, from Feb. 21 to 24 The Birmingham Gas Department have invited those taking part to visit the gas-works on the Thursday morning; and the Birmingham Chamber of Commerce and the British Industries Fair Management Committee have issued an invitation to take lunch at the Fair prior to the visit of inspection on Wednesday afternoon.

PROGRAMME OF CONFERENCE.

TUESDAY, FEB. 21.—In the Small Lecture Theatre of the Birmingham and Midland Institute.

10.0 a.m. Prof. Arthur Smithells, F.R.S., the Chairman of the Joint Committee, will introduce Sir Richard Threlfall, F.R.S., Chairman of the Board of Fuel Research, who will welcome the Conference to Birmingham.

10.30 a.m. Session I. Chairman: Dr. G. C. Clayton, M.P. (Society of Chemical Industry).
The following contributions will be presented (in abstract) for discussion:
(*a*) "The General Scope of the Gas Industry."
(*b*) *"Some Phases of Modern Practice in Gas Manufacture." By Thomas Hardie, M.Inst.C.E.
(*c*) †"Presidential Address to the Southern Association of Gas Engineers and Managers, 1927." By Thomas Hardie, M.Inst.C.E.
(*d*) "Continuous Vertical Retorts." By Michael Barash, M.Sc. (Tech.), A.I.C., and T. Campbell Finlayson, M.Sc., A.M.I.Chem.E.
(*e*) ‡"Vertical Intermittent Chamber Ovens for Gas Manufacture." By N. J. Bowater, O.B.E., B.Sc., Assoc.M.Inst.C.E.
(*f*) "Intermittent Vertical Chambers." By R. H. Ruthven.
Discussion.

12.30 p.m. End of session.

Session II.

2.15 p.m. Continuation of discussion on papers read during Morning Session.

5.0 p.m. End of session.

* "Fuel Economist," December, 1926. † "GAS JOURNAL," April 6, 1927. ‡ "GAS JOURNAL," Dec. 7, 1927.

WEDNESDAY, FEB. 22.—In the Small Lecture Theatre of the Birmingham and Midland Institute.

10.0 a.m. Session III. Chairman: Mr. G. A. Hebden[(President, Coke Oven Managers' Association).
The following contributions will be presented (in abstract) for discussion:
(*g*) "The General Scope of the Coke Oven Industry." By C. P. Finn, B.Sc., F.I.C., and R. Ray, B.Sc., A.I.C.
(*h*) "Modern Coke Oven Practice." By G. J. Greenfield and G. H. Harrison.
(*j*) "Coke Research and the Steel Industry." By E. C. Evans.
Discussion.

12.0 noon. End of session.
Those who have accepted the invitation to lunch at the Fair will leave the Midland Institute by motor transport at 12.20 p.m.

1.0 p.m. Lunch at the British Industries Fair by invitation of the Birmingham Chamber of Commerce and the British Industries Fair Management Committee.

5.0 p.m. Return to Birmingham by motor transport.

THURSDAY, FEB. 23.

9.45 a.m. Those who have accepted the invitation of the Birmingham Gas Committee to visit the works will meet at 9.45 a.m. at the Birmingham Gas Department, Edmund Street, and will be conveyed by motor transport to the works.
Visit to gas-works.

12.45 p.m. Return to Birmingham by motor.

Session IV. Chairman: Mr. J. Terrace (Vice-President, Institution of Gas Engineers).

2.30 p.m. In the Small Lecture Theatre of the Birmingham and Midland Institute.
The following papers will be presented (in abstract) for discussion:
(*k*) "The Production of Blue and Carburetted Water Gas in Vertical Retorts." By T. F. E. Rhead, M.Sc., F.I.C.
Discussion.
(*l*) "Gas-Works Refractories." By A. T. Green, F.Inst.P. (Ass. Member).
Discussion.
(*m*) "Gas-Works Effluents." By Albert Parker, D.Sc.
Discussion.

5.0 p.m. End of session.

FRIDAY, FEB. 24.—In Queen's College, Paradise Street.

10.0 a.m. Session V. Chairman: Dr. F. A. Preeth, F.R.S., F.I.C. (Institute of Fuel).
(*n*) "The Handling, Preparation, and Utilization of Gas-Works Coke."
(*p*) "Blending in the Gas and Coke Oven Industries." By John Roberts, D.I.C.
Discussion.

12.30 p.m. End of session.

Session VI.

2.15 p.m. (*q*) "A General Review of Low-Temperature Carbonization." By F. S. Sinnatt, M.Sc., F.I.C.
(Contributions to the discussion are expected from technical staffs, connected with about a dozen processes of low-temperature carbonization, who have been invited to attend.)

5.0 p.m. End of session.

ADVANCE COPIES OF PAPERS.

The "GAS JOURNAL" will publish, on Feb. 14, the whole of the original papers presented at the conference, together with précis of those papers starred, as a special number of the "JOURNAL." This will be issued free to all subscribers to the "JOURNAL;" and those requiring extra copies, and those who are not subscribers to the "JOURNAL," can obtain the complete set of papers in the form of this Special Number by remitting 2s. 6d. direct to the "GAS JOURNAL," 11, Bolt Court, Fleet Street, E.C. 4. As no papers will be read *in extenso*, it is advisable that all members attending the conference, and others interested, should write early for copies of the papers.

Note.—Mr. Bowater's paper (*e*) can be obtained direct from the Institute of Fuel, 53, Victoria Street, S.W. 1, by remission of 6d. in stamps.

THERMAL EFFICIENCY OF INTERNAL COMBUSTION ENGINES.

The Question of Standards.

Before the Institution of Civil Engineers on Tuesday, Jan. 10, Sir Dugald Clerk, K.B.E., F.R.S., read a paper entitled "Standards of Thermal Efficiency for Internal Combustion Engines," in which he advanced the view that the time has come for the application of accumulated knowledge to the substitution of real working fluids for the ideal properties, which were necessary because of ignorance of the real.

Referring to the Heat Engine Trials Committee's proposal to adopt the Atkinson cycle, instead of the actual cycle of operations, as a standard for all types of engine, this cycle is quite unsuitable for any engine of any other cycle, because its efficiency increases with temperature rise, and it is always higher than the efficiency of the constant-volume or other engine of the same thermodynamic compression-ratio.

In all actual working constant-volume, constant-pressure, and Diesel types of engine, indicated thermal efficiency falls with increasing temperature; and it is only in the Atkinson cycle that it increases with higher temperatures. It is a suitable ideal cycle for comparison with a similarly operating cycle in actual use, but for no other. For constant-volume engines, the relative efficiencies would be very much too low. It would increase the error of the old air cycle in constant-volume engines by showing an impossible margin still remaining for thermodynamic improvement. The relative efficiencies given, compared with the Atkinson cycle, as calculated in the report of the Committee are for—

Petrol engines	53·1 p.ct.
Gas engines	59·1 "
Airless-injection oil engines	59·5 "

That is, all these engines, according to this method of calculation, seem to have a possibility of utilizing to better advantage respectively 46·9, 40·9, and 40·5 p.ct. of the heat given to them. No such possibility exists, as the consideration of the actual properties of the working fluid accounts, at present, for nearly 90 p.ct. of the total heat which they could possibly turn into work.

As has been pointed out, the Atkinson cycle gives a high ideal thermal efficiency, and engines built to follow it would be very economical; but, so far, no engines existing at present carry out the cycle required to produce such efficiencies. In 1882, the author built a two-stroke engine of this type, but he found that the mean pressure obtained was too low to permit of competition with the usual type of constant-volume explosion engine. Mr. Atkinson, at a later date, invented a very ingenious engine to carry out the cycle. The Royal Society of Arts trial in 1888 proved the engine to be very economical, but the expansion was not complete in the sense used in the previous description, and the mechanism was complicated. The type does not exist now. It might, however, be useful for large cylinders, as great expansion could be obtained without unduly high compressions. Its cycle is still worth study, but not as a general standard for engines of other cycles.

"Patents for Inventions."—The handbook bearing this title, written by Mr. Benjamin T. King, the Managing Director of King's Patent Agency, Ltd., is an interesting compilation of useful information. Having discussed the nature of patents, and pointed to the weaknesses exhibited by the novice in drawing them up, the author considers the procedure in patenting. Then foreign and colonial patents are dealt with, followed by short sections on trade marks, designs, and copyright. The 1928 edition has been revised up to date.

GAS LIGHT AND COKE COMPANY.

Annual Report and Accounts.

The following is the report of the Directors of the Company for the year ended Dec. 31 last, which will be presented at the ordinary general meeting on Friday next.

The accounts for the year show that, after paying in respect of the June half-year dividends at the rate of 4 p.ct. per annum on the 4 p.ct. preference stock, 3½ p.ct. per annum on the 3½ p.ct. maximum stock, and 5 p.ct. per annum on the ordinary stock, and after contributing the sum of £15,000 to the redemption fund, there is a total available balance of £744,165 12s. 3d., out of which the Directors recommend the payment of the following dividends in respect of the December half-year: On the 4 p.ct. preference stock, at the rate of 4 p.ct. per annum; on the 3½ p.ct. maximum stock, at the rate of 3½ p.ct. per annum; and on the ordinary stock at the rate of £5 1s. 4d. p.ct. per annum, which, together with the further sum of £20,000 to be contributed to the redemption fund, will absorb £622,588 11s. 2d., and will leave £121,577 1s. 1d. to be carried forward to the credit of the current year.

The sale of gas during the past year shows an increase of nearly 3 p.ct. There has been an addition for the year to the number of the Company's consumers of 26,495, and an increase of 96,865 in the number of gas stoves sold and let out on hire.

In addition to the reduction in the price of gas by 1·4d. per therm, which took effect as from the reading of the meter indices for the March quarter, the Directors were able to reduce the price by a further 0·8d. per therm as from the reading of the meter indices for the June quarter, by a further 0·4d. per therm as from the reading of the meter indices for the September quarter, and by a still further 0·4d. per therm as from the reading of the meter indices for the December quarter, thereby reducing the price of gas in the old Gas Light Company's area to 8·6d. per therm, which is equal to the lowest price since the war.

DAVID MILNE-WATSON,
Governor.

Horseferry Road, Westminster, S.W. 1,
Jan. 26, 1928.

The Accounts.

The following are the main features of the accounts for the year:

The statement of capital (stocks) sets forth that the total paid up is £11,575,066; added on conversion £14,424,874—total £25,999,940. Deducting the amount redeemed (£534,440), the total amount of the Company's existing capital powers is £25,465,500.

The statement of loan capital stands thus: Total paid up, £5,667,792; added on conversion, £2,124,983; remaining unissued, £4,980,215—total amount authorized, £12,772,990.

CAPITAL ACCOUNT.

The capital account shows the following expenditure:

Expenditure.

	Expended this Year.	Total to Dec. 31, 1927.
Expenditure to Dec. 31, 1926		£19,669,123 17 2
Expenditure during the year to Dec. 31, 1927—		
Lands acquired, including law charges	£68,275 16 9	
Buildings and machinery in extension of works	80,671 15 11	
New and additional mains and service-pipes	353,605 0 9	
Do. do. meters	71,698 0 0	
Do. do. stoves	169,387 10 10	
	743,638 4 3	
	£20,412,762 1 5	
By sale of surplus land	£5,892 18 10	
„ amount written off plant	9,652 0 0	
„ depreciation of stoves	79,027 0 0	
	94,571 18 10	
Total expenditure	£20,318,190 2 7	
Nominal amount added on conversion	16,549,857 0 0	
	£36,868,047 2 7	
Deduct amount of capital redeemed under the Gas Light and Coke Company's Act, 1903—		
Per previous account	£495,460 0 0	
This year	38,980 0 0	
	534,440 0 0	
	£36,333,607 2 7	

REVENUE ACCOUNT.

Revenue.

Year, 1926.		£ s. d.	£ s. d.
	Sale of gas—		
£8,691,489	Per meter at 11·6d., 10·2d., 9·4d., and 9·0d. per therm*	9,243,026 15 4	
238,815	Public lighting and under contracts	244,945 2 10	
8,930,304			9,487,971 18 2
299,296	Rental of meters	..	302,821 19 10
432,269	Rental of stoves	..	479,945 6 7
488,501	Rental of fittings	..	488,392 14 3
	Residual products—		
1,704,347	Coke, less labour, &c.	1,437,890 14 8	
161,374	Breeze, less „ „	91,322 11 2	
436,628	Tar and tar products	638,088 0 3	
79,003	Ammoniacal liquor and sulphate of ammonia	96,362 16 5	
2,381,352			2,263,864 2 6
25,247	Rents receivable		27,520 6 2
650	Transfer fees		707 17 0
12,548,619			£13,051,224 4 6

* The price in the Brentford area was higher by the amount per therm authorized by the Gas Light and Coke Company's Act, 1925.

Expenditure.

Year, 1926.		£ s. d.	£ s. d.
	Manufacture of gas—		
£3,923,981	Coal, including all expenses thereon	4,093,495 19 8	
523,767	Oil „ „ less value of oil tar	298,590 14 0	
606,316	Coke, &c., used in the manufacture of carburetted, &c., water gas	282,733 10 3	
120,847	Salaries of engineers and other officers at works	131,719 1 5	
424,788	Wages	425,514 8 5	
50,321	Purification	48,109 19 8	
1,834,577	Repair and maintenance of works and plant, materials and labour, less received for old materials, £12,637 6s. 8d.	1,931,710 9 11	
7,484,597			7,211,874 3 4
	Distribution of gas—		
489,923	Salaries and wages (including rental clerks) and cost of pumping gas	521,420 15 3	
643,078	Repair and maintenance of mains and service-pipes, &c.	757,203 4 4	
357,783	Repair and renewal of meters	503,789 16 7	
666,837	„ „ stoves	689,901 16 7	
108,056	Fitting up automatic meter supplies	130,716 11 7	
2,265,677			2,603,032 4 4
111,801	Public lamps—lighting and repairing	..	101,440 0 10
	Rents, rates, and taxes—		
22,289	Rents payable	22,057 16 0	
548,191	Rates and taxes	537,446 14 7	
570,480			559,504 10 7
	Management—		
12,500	Directors' allowance	12,500 0 0	
800	Company's Auditors	800 0 0	
68,730	Salaries of management staff	77,121 0 7	
174,329	Collectors and cashiers	180,048 2 6	
50,605	Stationery and printing	51,624 2 4	
75,328	General charges	71,909 18 0	
382,292			394,003 3 5
84,455	Co-partnership	..	82,486 14 3
6,463	Parliamentary charges	..	158 8 11
2,321	Law charges	..	1,991 8 4
523	Rating charges	..	4 9 0
8,971	Bad debts	..	11,792 18 11
1,000	Depreciation fund for works on leasehold lands	..	1,000 0 0
152,912	Annuities and contributions to superannuation funds	..	159,990 6 5
7,839	Workmen's compensation	..	7,506 12 10
63,374	Company's contribution under National Insurance Acts	..	63,029 10 1
63,995	Expenses re Brentford amalgamation	..	112,293 13 10
	Public officers—		
2,824	Contribution under Gas Regulation Act, 1920, and Official Auditor	2,699 16 0	
1,249	Public testing-stations	1,427 3 1	4,126 19 1
11,210,773			11,314,235 4 2
1,337,846	Balance carried to net revenue account		1,736,989 0 4
12,548,619			£13,051,224 4 6

Total Wages Paid, 1927, £2,938,854. Total Salaries Paid, 1927, £717,390.

NET REVENUE ACCOUNT.

The total of the net revenue account is £1,801,635. The following statement shows how it is appropriated:

Year 1926.		£ s. d.
£243,793	.. Interest on debenture stocks and mortgage bonds for the year	£286,859 5 0
134,916	.. Interest on temporary loans and sundry funds, less credits	158,284 2 8
	Dividends, &c., for the half-year to June 30, 1927:	
	Dividend on the 4 p.ct. consolidated preference	
83,140	.. stock, £83,140 8s.	
45,500	.. Dividend on the 3½ p.ct. maximum stock, £45,500	
20,000	.. Contribution to redemption fund, £15,000	
£5 1s. 4d. p.ct. 475,987	Dividend on the ordinary stock (£5 p.ct. per annum), £468,686 10s.	
624,627		612,326 18 0
676,974	.. Balance applicable to redemption fund and to dividends, December half-year, 1927	744,165 12 3
£1,680,310		£1,801,635 17 11

Proposed Appropriation of Balance on Net Revenue Account, Dec. 31, 1927.

Year 1926.		£ s. d.	£ s. d.
£676,974	Balance	..	744,165 12 3
	Amount required for dividends, &c., for the half-year to Dec. 31, 1927:		
	Dividend on the 4 p.ct. consolidated		
£83,140	preference stock	83,140 8 0	
	Dividend on the 3½ p.ct. maximum		
45,500	stock	45,500 0 0	
15,000	Contribution to redemption fund	20,000 0 0	
£5 0s. 0d. p.ct. £468,687	Dividend on the ordinary stock, £5 1s. 4d. p.ct. per annum on £18,708,480	473,948 3 2	
£612,327			622,588 11 2
£64,647	Balance carried to next year's account	..	£121,577 1 1

Statement of Coal.

—	In Store Dec. 31, 1926.	Received during Year.	Carbonized during Year.	Used during Year.	In Store Dec. 31, 1927.
	Tons.	Tons.	Tons.	Tons.	Tons.
Coal	227,753	2,715,354	2,641,904*	3717	297,486

* In addition to this quantity of coal, 17,780,620 gallons of oil have been used during the year.

Statement of Residual Products.

Description.	In Store Dec. 31, 1926.	Made during Year.	Used during Year.	Sold during Year.	In Store Dec. 31, 1927.
Coke—tons	32,441	1,672,081	309,107	1,333,664	61,751
Breeze—tons	12,043	279,755	44,426	218,376	28,996
Tar, from coal only—galls.	2,579,333	27,017,196	26,105,155	578,219	2,913,155
Ammoniacal liquor—butts	41,263	796,639	798,918	..	38,984

The four statements relating to the redemption, reserve, special purposes, and depreciation funds stood as follows on Dec. 31: Redemption fund, £15,000; reserve fund, £146,420; special purposes fund, £546,229; and depreciation fund, £105,593.

The remaining statement is the balance-sheet, which gives the value of the stores on hand at the close of the year as follows: Coal, £321,966; gas oil, £59,022; coke, £46,313; tar and ammoniacal liquor and products, £176,099; and sundry stores, £1,148,491. The figures at the end of 1926 were: Coal, £600,224; gas oil, £110,332; coke, £40,551; tar and ammoniacal liquor and products, £200,885; and sundry stores, £1,073,891.

Statement of Gas Made, Sold, &c.

		Quantity Made.	Quantity Sold.			Quantity Used on Works, &c.	Total Quantity Accounted for.	Quantity Not Accounted for.	Number of Public Lamps.
			Public Lights and Under Contracts (Estimated).	Private Lights (per Meter).	Total Quantity Sold.				
1927.	Cubic feet (thousands) .	49,047,064†	843,914	45,499,136	46,343,050	551,869	46,894,919	2,152,145	45,903
	Therms . . . . . §	246,192,905	4,236,131	228,383,641	232,619,772 *(231,715,250)	2,770,064	235,389,836	10,803,069	
1926.	Cubic feet (thousands).	47,429,073	816,323	44,228,163	45,044,486	560,796	45,605,282	1,823,791	47,731
	Therms	237,922,825	4,995,345	221,866,338	225,961,683	2,813,257	228,774,940	9,147,885	

* At declared calorific value—viz., 500 B.Th.U. per cubic foot.
† Including 13,839,538 thousands of carburetted, &c., water gas.
§ At actual calorific value—viz., 502 B.Th.U. per cubic foot.

APPLICATION OF WELDING TO GAS-WORKS PLANT.

By H. E. GROVE, of Melbourne.

[From a Paper before the Australian Gas Institute.]

The author discusses some developments in gas plant construction that have come directly under his own knowledge, and in which he has had the honour of being associated with Mr. J. N. Reeson, the Engineer-in-Chief and Technical Adviser of the Metropolitan Gas Company (Melbourne). As these developments are largely the outcome of the great advance made in the metallic arc welding process, a brief description of that process is necessary.

METALLIC ARC WELDING.

Metallic arc welding is, comparatively, a modern process, and during the great war received much attention, which led to many improvements, both in the welding plant and electrodes. The improvements have been continuous to the present time, so that it is slowly but definitely replacing rivets. It is a true welding process, inasmuch as two steel members may be joined together into one homogenous whole, and in such a manner that if a welded joint be sawn through it is impossible to discover with the naked eye the difference between the weld and the original steel.

The procedure of metallic arc welding consists in connecting the steel sections, which are to be welded, to one side of a suitable source of electric energy, and a metal electrode to the other side. When an arc is struck and maintained between the electrode and the steel sections, an intensely hot current flows between the two, which melts the electrode and the steel sections at the point where the arc is maintained, fusing the members and the electrode metal together. Electric energy may be either direct or alternating current. Direct current is generally supplied through generators which maintain a voltage of 60 when running idle, but drops to 25 or 30 volts when the arc is struck. Alternating current is stepped-down, through a transformer, to between 90 and 110 volts, and taken through current regulators to the work. The author favours alternating current, as the plant required is much simpler, and is less liable to go out of order, besides being much cheaper in first cost. The class of current, however, makes no difference to the work.

The existence of well-equipped structural and mechanical workshops in the Construction Department of the Metropolitan Gas Company enabled a thorough investigation to be made of the process; and we were able to substitute, bit by bit, welding for riveting as our knowledge grew. It was seen very early that the welder should not be relied on for anything but the necessary manual skill in applying the electrode.

For a metallic arc weld only the very best materials should be used. In this direction, we have adopted the "Quasi Arc" electrode as our standard for all our welding purposes. This electrode has highly desirable characteristics. The covering on this electrode fuses at the same rate as the wire rod, forming a slag which floats on the surface of the molten metal. It acts as a flux, cleaning the molten metal, and allowing the impurities to rise and mingle with the slag. It also protects the molten metal from the atmosphere, effectually preventing oxidation. The slag is not removed until the metal below is comparatively cool, thus ensuring that the metal does not become brittle. The slag has another very important feature from the point of view of the training of the operators, inasmuch as they do not require the high degree of skill necessary for maintaining the arc with bare wire. As the slag acts as a secondary conductor, it is only necessary to puddle it with the tip of the electrode with a to-and-fro weaving motion. This system of welding produces very uniform results; and we have found, when working 24 welders at a time, that there is not a very great deal of difference between the work of the best welder and that of the last-trained man.

Supervision of welding, like all other things, is largely a matter of experience. Welding done with ordinary care, and with the exercise of proper safeguards, can be as reliably performed as riveting. To the trained eye, visual inspection is often sufficient. We have taken extraordinary care in our welding procedure, as we have had to break a great deal of new ground. All our drawings are prepared for welding procedure, and contain complete instructions for the sizes and amounts of electrodes to be used. The welding in the workshop is supervised by a welding foreman, under the direction of the shop foreman, who is held responsible. The foreman erector is assisted by a leading welder, whose sole duty is to supervise every inch of welding as it is being laid down. It may be that we are making our inspection service too stringent. In the author's opinion, however, the safeguards necessary for welding are just as necessary in riveted or concrete structures.

The modern electrode and welding plant are of a high standard of excellence. One test was made to determine the strength of actual deposited metal; and the result was rather gratifying. The tensile strength is greater than that of a medium casting; but the yield point—the true criterion of strength—and the elongation are higher than those of a hard steel casting. Another test indicated that, though the weld metal is not so ductile as the mild steel manufactured for steel structures, it has excellent properties. Its purity may be assessed from the fact that micro-photographs of a weld made in "Armco" iron showed no difference in structure between the weld metal, metal adjacent to the weld, and the parent metal. The effect of welding on the steel members may be gathered from a report given by the Melbourne University on a series of metallographical tests on welded joints, where it is stated that the metal, rather than being deteriorated, is improved.

Having shown that we can make a weld without harming the members welded, that the electrodes are above suspicion, that competent operators can be easily trained, the question arises: "Why weld when you can rivet?" The answer is that welding is revolutionizing structural design, increasing the efficiency of structures, and reducing costs. We know that in members under tension stresses we have to weaken our sections at their vital points—the joints—in order that rivets or bolts may be inserted. This means that much useless metal has to be used in the body of the member, in order that a sufficiency may re-

main in the joint after 50 to 30 p.ct. has been removed. A welded joint is not made by removing metal, but by applying metal; and enough electrode metal may be added to give 100 p.ct. efficiency, and more. Consider the development which this means in steel tank construction and design. Here is one direction in which modern developments in gas plant construction may be made.

Building of Five Welded Gasholders.

At the Metropolitan Gas Company's Fitzroy Station, a single-lift gasholder of 160,000 c.ft. capacity, working in a brick tank 102 ft. diameter by 21 ft. 6 in. deep, was demolished to make room for a four-lift holder having a capacity of just over 900,000 c.ft. The tank depth had, of course, to be increased; and this was done by adding a steel plate extension, 17 ft. 6 in. over-all, projecting 11 ft. 6 in. above the tank. The extra 6 ft. went into the tank, in order to protect the raised ground level. This extension was in four tiers—the lower $\frac{3}{8}$ in. thick, then $\frac{5}{16}$ in., and the two upper $\frac{1}{4}$ in. thick. The only fabrication done in the shops was to roll the $\frac{3}{8}$ in. plates to the proper curvature. The remaining plates went from the stock shed straight to the site. We saved the costs of handling 75 p.ct. of the plates in and out of the shop, saved all marking off, shearing, and punching costs; and, more important still, none of the plates was deteriorated by the shearing and punching stresses. Any excess of metal went into the laps. The absence of holes in the plates at erection caused no delay; for a very simple and effective procedure was evolved, which allowed erection to proceed as readily as if conventional bolt holes had been provided. It is certainly surprising how quickly a tank can be erected and welded, and with what certainty the tightness of the joints may be guaranteed. Comparing a welded tank with a first-class riveted tank, the time taken in welding is about the same as is required to caulk the seams in a riveted structure. This allows a saving of (say) 75 p.ct. of shop-work and overhead and riveting time at erection, and a saving of materials due to the fact that 100 p.ct. efficiency in the joints can be guaranteed.

The guide-framing of this holder presents several novel features; both the standards and the horizontal struts being formed of welded steel tubes. There are twelve standards 146 ft. high, 18 in. diameter for the three lower tiers, and 15 in. for the two upper tiers. Of the five tiers of horizontal struts, the three lower are 15 in. diameter, and the two upper 12 in. diameter. The metal throughout is $\frac{1}{4}$ in. thick, though $\frac{5}{16}$ in. would have been sufficient to take care of the maximum forces in the framing. We felt, however, that, in view of all happenings (corrosion and the like) the extra $\frac{1}{16}$ in. of metal was worth adding. Even so, the great economy of this construction is shown by the fact that there are only 125 tons of metal in the whole framing.

Early Troubles.

Gasholder construction is very fascinating, as there seems to be no limit to the development of the builder's ingenuity. We have built five welded holders to date; and on each something new has been learned. The first gasholder to be welded was a three-lift, 3 million c.ft. one, built to replace the original holder that had collapsed. We had already done a certain amount of welding, and had about five welders employed when we commenced erection. It was at erection that our troubles began; for there cannot be a more severe example to set the welding tyro than a gasholder. We did not anticipate the inevitable contraction that occurs in a welded seam; and we had not proceeded far with the welding of the outer lift of that holder before we found that the portion of the sides on which we were operating presented the appearance of the chord of an arc. Without contraction, metallic arc welding would be the acme of simplicity; but contraction is the chief thing the beginner has to guard against.

We now anticipate the distortion due to contraction, and make all allowances for it, distorting our work first, before we weld, to counteract the welding distortion. The required amount of preliminary distortion can only be found from experience; and when once the work has been set out properly, the action of the welding eases the work back to normal, and takes out any locked-up stresses. After considerable tribulation, a method was evolved to counteract this contraction; and this has been used in all succeeding holders. As the work has while being erected to be held together with small bolts about 13 in. to 18 in. centres, we used $\frac{1}{4}$ in. bolts in $\frac{3}{8}$ in. holes, and then fixed wooden beams between the vertical stays, and wedged the sheeting out to the full extent of the slip of the bolt in the bolt-hole. As the welding proceeded, the pull of the sheeting cambered our wooden beams; and when these beams were removed, the sheeting was found to be exactly to shape, and where it was wanted.

A Holder Ahead of the Usual Type.

Following this, a four-lift $2\frac{3}{4}$ million c.ft. holder was welded at Fitzroy; then a single-lift 500,000 c.ft. one at Richmond; and, lastly, a three-lift 3 million c.ft. one at North Melbourne. The design of the North Melbourne holder is a step ahead of the usual type. An existing holder had to be removed, and a new one built, using the existing tank and framing. In the new holder every attempt was made to combat corrosion; and to this end the crown and side sheeting were of "Armco" iron. The top curb was of cellular construction, and kept entirely outside the holder. The vertical stays of the outer and middle lifts were formed of two 8 in. by 3 in. R.S. channels, with the edges of their flanges welded to a steel plate between them. Thus one channel of each stay was outside the holder in a position where it could be kept painted. The side sheeting was disposed vertically, instead of in circumferential rings. This enabled us to use sheets 15 ft. by 4 ft. by $\frac{9}{64}$ in. Larger sheets would have been employed, but for the difficulty of handling them in the shop and through the machines.

The shopwork on these sheets was interesting, indicating how welded construction lends itself to workshop organization. The sheets had to be straightened and punched. It was necessary to provide holes about 15 in. centres along the edge, as we had not yet evolved a means of erecting gasholder sides without small bolts, though we had tried the use of magnets. A seven-roll straightening machine was arranged in tandem with the punching machine, and horizontal roller tables were placed, one between the machines and one on either side. The sheets were loaded on to either one of the two long trolleys running on parallel narrow gauge, and taken alongside the table ahead of the straightening rolls. Each sheet was lifted off singly on to this table by one man, by means of a cradle (slung from an overhead crane) containing six magnets. After passing through the rolls the sheet was pushed on to a carrier running through the punching machine. The sheet was located by stops at one end and one side, and then secured in position by two magnets. A spacer bar was bolted on to the side of the carrier, having drilled holes accurately spaced to correspond with the bolt holes to be punched in the sheets. A selector lever automatically held the sheet and carrier at the appropriate positions. By this method, the labour cost of handling the sheets to the machines, straightening, punching, and then stacking, was only 8s. per ton.

The holder lifts were arranged so that each succeeding one was lifted direct through the vertical stays, instead of through the cups and dips, thus minimizing the effect of the eccentric load on these members. We had to cut 525 tons out of the old masonry tank, re-set the tank guides, provide new rest blocks, reconstruct the timber framing in the tank, repair the guide-framing, re-set the column guides, and build-in 550 tons in the new three-lift gasholder. It was exactly six months to the day between the first cut in the old holder and the first inflation, for testing, of the new holder. No overtime was worked, except during the welding of the top curb, where it was considered essential that the cellular construction should be completed as soon as possible, before rain got into it.

The lifts took three weeks each to complete, and an average of 45 men were employed. A well-known English firm were erecting a riveted gasholder, of the same size, in Melbourne at the same time; and their best performance was five weeks per lift, with a much larger force of men. In the erection of each lift, after the cup had been set out, a gang would start erecting the vertical stays. As soon as they were four or five stays ahead, another gang would start on the dips; and as soon as they were far enough ahead, the gang erecting the side sheeting would start. Then would follow the gang propping-out the sides, and after them came the welders. Welding on the side sheeting would start before the first gang completed erecting the vertical stays. Each bay of side sheeting was composed of six sheets; and these were bolted together in threes on the top of the tank before being sent down.

This holder tested-out to our complete satisfaction, being perfectly tight. This is characteristic of welded structures. All our five welded gasholders have been gas-tight since their inflation. A welded structure is a homogeneous whole—not, as in a riveted structure, an aggregation of units. With the laps welded on both sides, the joints are the strongest part of the structure; for there the metal is of double thickness. On plated work, such as tanks, gasholders, bunkers, and the like, the draughtsmen are relieved of the tedious detailing of rivet holes and the attendant calculations, with a consequent increase in their output. Savings here may range up to 50 p.ct. As the holding required is merely for location purposes, we cannot use the conventional intersections for our dimensions. We employ, instead, one side and one edge of a plate or sheet from which we take our measurements.

Coal Unloader.

Gasholders have been rather fully discussed, because they contain all types of structural engineering work. Light and heavy tank work, heavy plated girders, circular work, and latticed framing, &c., are all to be found in a gasholder. The workmanship, too, has to be of a high order of accuracy. As we developed the design, we came to an understanding of the economics of welding; and this indicated that the whole subject of welded structural engineering offered great economies in design. A clever, competent designer may be able to effect savings of about 25 p.ct. in the weight of materials over a similar riveted construction. Generally, the saving is about 8 p.ct. on struts, 12 p.ct. on beams, and 17 p.ct. on ties. The greatest savings occur in the connections.

An interesting example of how reduction in the weight of a structure may be made is given by the design for a coal unloader

recently considered for a large coal handling proposition. A local contracting firm, in preparing their tenders for this plant, desired that the Construction Department should provide the steelwork to their order, if they were successful in obtaining the contract. This meant that we had to check their designs and prepare estimates. The contractor designed the unloader as a riveted structure, with a total weight of about 64 tons. After making the most liberal allowance in every direction, the welded structure did not exceed 46 tons. The efficiency of the latter design was higher than the contractor's; for all the joints had an efficiency of 100 p.ct.

COKE HANDLING PLANT.

These developments in design were fully taken advantage of in the new coke handling plant at West Melbourne, put into operation last September. This plant is designed to serve six 2 million c.ft. continuous vertical retort houses, of which five are built and working. The coke plant consists of a system of four tipping tray conveyors, screen, and coke bunkers. Every effort was made to utilize, to the fullest, the economies that can result from employing welding; and without in any way departing from conservative stresses. We standardized our parts as much as possible.

Early in the year a belt conveying system was installed between the vertical retort houses and a coal store. This work was publicly advertised; and as the next tender was about 80 p.ct. higher than the price the Construction Department offered, the work was given to the department. Steel replaced cast iron wherever possible; and the conveyor rollers and return rollers, instead of being ¼ in. thick, as is usual with castings, were made out of 16 gauge steel, which is quite stout enough for the purpose. The driving and tension drums and belt pulleys were also welded; gearing consisting of toothed rings bolted on to the steel centres. In the event of a breakage, only a part requires renewal. The conveyor rollers were mounted on 2 in. pipe frames about 12 ft. 6 in. long, on which were three sets of troughing rollers and two sets of return rollers. All work was drilled and set-up on jigs, which ensured extreme accuracy. This method of construction considerably simplified work at erection, as it was only necessary to drop the frames on to the places prepared for them.

WELDING FOR RETORT HOUSES.

In June, 1924, No. 4 unit of the continuous vertical retort installation was put into action. This house was completely built by the Construction Department, and was the first large framed structure, other than gasholders, to be welded. This house has been followed by No. 5 unit, in which experience allowed us to effect certain changes in design. These changes enabled us to add nearly 50 p.ct. to the capacity of the bunkers and 40 p.ct. to the coal hoppers, and materially to enlarge the coke chambers below, at but little extra cost over that of the previous installation. We are now remodelling No. 2 unit; and our energies are largely concerned in the substitution of welded steel for iron castings. The substitution of welded steel for cast iron is a direction in which the engineer can profitably engage. The raw steel is half the price of the raw casting; and the weight of the finished product will be one-half to one-third. Machining can be materially reduced, for the steel section is far more regular than the casting; and no waste labour is incurred, as with a casting in which serious hidden flaws are exposed by the process of machining. A casting will break, but welded steel will only bend, under accidental loads. Considerable savings can be made by the elimination of patterns; and frequently the welded article can be produced before the equivalent pattern can be made.

STEEL PURIFIERS.

We built, in 1923, a 2⅜ million c.ft. set of boxes, arranged in a square. This arrangement is much more economical than putting the purifiers in a line; for not only are the connections simplified, but, with the purifiers in a square, two-thirds of the gas mains can be eliminated. Moreover, the four boxes in a square require twelve walls, as against thirteen in the line arrangement. The saving in weight of a steel plate set over the usual cast-iron boxes is very great—more than 50 p.ct., in fact. In the sides and bottoms steel plates of ⅜ in. thickness are used, as against ¾ in. in cast iron; the ⅞ in. thick cast-iron flanges with cast-iron ribs and ¾ in. bolts spaced every 6 in. are omitted; and the whole of the expensive machining of the flanges is not required. The saving in weight of the boxes means an appreciable relief to the structure carrying them. The welded steel purifier set at West Melbourne was 76 ft. long by 50 ft. wide by 6 ft. deep, divided into four boxes, 38 ft. by 25 ft., with two tiers of grids; and each box was provided with four covers.

The usual practice in the support of overhead purifiers is to provide grid bearers carried on standards within the boxes, and transfer the loads from the standards on to a system of beams and columns below. In the West Melbourne purifiers, the grid bearers were made to act as the top and bottom flanges of internal girders; and from these girders, which also carry the oxide, we hung the bottom plates of the boxes. Thus there was nothing at all under the boxes. Twelve columns carried the whole structure; eight being spaced around the sides, and a group of four about the mid-point. A rectangular opening was provided through the centre—*i.e.*, at the junction of the four boxes, where the whole of the connections were arranged. The inlet to the boxes was jacketed round the outlet; and so, except for the main inlet and outlet mains, there were no connections under the boxes.

The lifting of the oxide to the boxes is arranged by means of tubs and electric lifting blocks on two overhead cranes. This is the simplest and most efficient form of mechanical handling on a purifying plant. Careful investigation of the labour required on purifiers equipped with oxide elevators and conveyors, and of those with electric hoists and buckets, shows that there is but little difference, and not enough to warrant the capital expenditure involved by the provision of elevating and conveying plant. As far as can be seen, these boxes are standing-up to their work well, with little evidence of corrosion. Of course, in this work we use heavier plates than are required to take care of the loads, allowing an additional thickness for corrosion.

On the older water-luted purifying sets, we have provided, to date, 26 new covers. The first was built in 1922; and some little while ago careful examination of this cover was made to ascertain what effect there was on the sheeting and the welding by corrosion. It was found that there was very little corrosion in the sheeting; and the welding was practically unaffected. Recently special inspection for corrosion was made of structures which were welded-up some years ago—such as gasholders, purifiers, &c.—but there was no evidence of accelerated corrosion, either in the weld or adjacent to it. Following this cover, which was made for the Fitzroy Gas-Works, twelve covers, each 25 ft. square, and weighing about 6½ tons, were built for the South Melbourne works, and, later, twelve similar covers for West Melbourne.

In addition to these main structures, a host of smaller work has been done, including condensers, Livesey washers, steel chimneys, tanks, and the multitudinous articles common to gas-works.

"SIFCO" BRONZE.

The metallic-arc is not the most suitable medium for welding cast iron. Our experience indicates that the intense local heat changes the character of the cast iron in some way that leaves it porous to gas or water; and this porosity exists just beyond, and adjacent to, the weld. We therefore turned our attention to the use of "Monel" metal and the oxy-acetylene flame. This proved a great advance; but we did not continue with it, as we had a proprietary alloy, "Sifco" bronze, brought under our notice, which we found almost ideal for the purpose. The term "bronze welding" is not correct, for it is not a weld—it is really a brazing. However, it gives a full-strength joint, and is easy to apply. Moreover, the oxy-acetylene flame brings the work to a dull cherry red only.

We have carried out a number of tests which prove that full-strength joints may be made. One test consisted of bronze welding together twelve short pieces of 4 in. cast-iron pipe into a 32 ft. length. After testing it with 50 lbs. of air pressure and finding it tight, we laid it loosely on two supports 29 ft. apart. A central load was gradually applied until 6¾ cwt. was put on, when it broke in the cast iron near a weld. Calculations showed that the full strength of the cast iron had been developed.

OXY-ACETYLENE CUTTING FLAME.

The oxy-acetylene cutting flame is another extremely valuable tool. With an expert operator, steel plates or sections may be cut as cleanly as by a machine saw. Large plates can be covered by a marker-off with all kinds of shapes, and so laid out that the minimum of waste is involved, and the whole cut-out cleanly and quickly with the flame in a manner impossible on any shearing machine.

In many instances, standardization of parts leads to a very great reduction in production costs. The author would cite the case of conveyors and elevators. In the vertical retort houses at West Melbourne, there are 2275 ft. of gravity bucket elevators; the gravity bucket elevators from the coal store contain 1200 ft. of chain and buckets; in the coke handling plant there are 1130 ft. of chain and trays; and there are another 1100 ft. of chain and trays in the covered coal store.

The "Super Lancashire" Boiler.—Messrs. Daniel Adamson, Ltd., of Manchester, are putting on the market a new "Super Lancashire" boiler, which may be constructed for any reasonable working pressure. They state that some of the main features of the boiler are as follows: Evaporation equal to, or higher than, an ordinary Lancashire boiler; less space occupied (maximum length 20 ft.); no high, costly chimney required; no economizer needed; cheaper foundations and brickwork; less weight; lower cost of insurance; higher efficiency; suitable for all classes of fuel; ready accessibility for cleaning; ample steam space; and smaller number of gusset stays.

"B.C.G.A." SCOTTISH DISTRICT CONFERENCE.

SUCCESSFUL GATHERING IN EDINBURGH.

Under the auspices of the British Commercial Gas Association, a Scottish District Conference was held in the City Chambers, Edinburgh, on Friday, Jan. 27. Both the morning and afternoon sessions were presided over by Councillor ANGUS M. GREGORSON, W.S., J.P. (Convener of the Edinburgh Corporation Gas Committee).

At the forenoon session, the Chairman was accompanied on the platform by Mr. F. W. Goodenough (Executive Chairman of the British Commercial Gas Association), Mr. W. M. Mason (Manager), and Mr. H. E. Bloor, of York.

THE CASE FOR GAS AS AN AID TO HEALTH.

By F. W. GOODENOUGH, C.B.E., Executive Chairman of the British Commercial Gas Association.

[EXTRACT.]

The cardinal consideration of modern theory and practice in regard to health is the doctrine that prevention is better than cure. It has been the principle of all enlightened races from the earliest times; and China perhaps has been most often cited as an instance of its practice, because from time immemorial her doctors have been paid to keep people well, and have had their fees withdrawn when illness overtook their patients. In the Western World for the past fifty years the history of medicine has been the history of preventive medicine.

No good or effective service can be rendered, nor the maximum amount of gas or of gas apparatus sold, in any other or less painstaking way, until in fact all the avenues of profitable business have been explored. Serious talk of "saturation" in any district is premature.

It is the chief aim of this paper to emphasize the facts on which the claim as to the value of gas as a heating agent is based; the enormous value and extreme importance of bringing them home to the public in every district; and the several conditions that must first be fulfilled if that is to be done satisfactorily, completely, and permanently.

We of the Executive Committee of the British Commercial Gas Association are convinced of the need for the closest possible attention to this subject; of the profit to the whole industry to be derived from that attention; and of the loss to the industry that at present accrues from neglect of it here and there. Thus I make no apology for once more emphasizing the salient facts and points:

> Doctors use and recommend gas fires.
>
> The highest consumption of gas per acre in any residential district is in that occupied by our leading physicians and surgeons.

What enormous power lies in those two statements for combating that prejudice against gas fires on the ground of health which still exists in the minds of many householders!

Are those two statements 100 p.ct. true in any district in the British Isles?

Are they 50 p.ct. true in the British Isles as a whole?

To what percentage are they true in *your* district?

To what extent would the consumption of gas in your district increase if it were true that every medical man, every hospital, every nursing home, every clinic, used and recommended gas for all fuel purposes?

These are questions which, it is suggested, deserve the closest attention, with action following upon the answers, by every gas undertaking from John o' Groats to Land's End.

There are other questions, too, closely bound up with them. What factors in the past created that prejudice against gas fires on grounds of their being detrimental to health—a prejudice at one time general, and still existing to an extent not always realized in the industry? Do any of those factors still operate in our districts? Where they no longer exist, how have they been removed, and is it possible to remove them entirely everywhere? In the opinion of the Executive, a searching, fearless investigation of the facts necessary to provide ourselves with absolutely candid and reliable answers to all these questions will be a highly remunerative form of activity throughout the industry. This is laid down not with the object of reproaching ourselves or anybody else with failure, in part or in whole, to recognize and act upon them earlier; but solely with the object of helping ourselves and everybody else to profit by those answers in the future. This is not—if indeed there ever is—a case for comparison between one undertaking and another for the purpose of feeding self-complacency; but emphatically one for comparison between present and possible attainment in each individual area. How nearly "100 p.ct." are *we*? How can we improve *our* percentage? Those are the vital questions for each undertaking.

Is there anyone who doubts that prejudice against gas fires on hygienic grounds *does* still exist to-day? If there be, let him ascertain how many of his own directors (or the members of his own committee) and of his personal friends and relations are entirely free from prejudice against gas fires, and are 100 p.ct. users of them.

No one, of course, questions that prejudice did exist. The fruitful question now is, "Why did such prejudice exist, and why does it still exist though in diminished and diminishing, but nevertheless considerable, degree? The answer, it is submitted, is that gas fires originally were badly constructed—mainly in principle, but partly in workmanship; atrociously designed; often imperfectly fixed, not seldom abominably so; and until recent years almost invariably neglected after installation.

It, indeed, speaks volumes for the inherent incidental advantages of gas heating, and it promises enormous development in the sale of gas for heating in the future, that gas fires continued to increase in number—one can hardly say in popularity—even in the bad old days of, well, not so very many years ago; bad old days that still, indeed, are not altogether ended.

Shortly—and to ignore all question of appearance—the defect of the old-time gas fire was that it relied to much too great an extent on convected instead of radiant heat for its warming efficiency. Upon the differences, physical and hygienic, between convected and radiant heat it is unnecessary to enlarge here. This question of convection *versus* radiation, of hot air in chilly surroundings *versus* cool air in warmed surroundings, is of vital importance to the gas industry; and the fact that the latter method of heating is the truly hygienic method, and why that is so, ought to be the commonplaces of everyone engaged in the industry. To the hearers and readers of this paper they doubtless are; but are we all certain, first, that everyone employed in our undertakings is equally familiar with the basic importance of this point; secondly, that our consumers as a whole know and appreciate the fact; and thirdly, that, in particular, every medical authority in our districts knows the case for radiant as against convected heat, and has had practical experience of its advantages?

The last sentence brings us to the crux of the whole business of popularizing gas heating and developing its enormous possibilities for the industry. The obstacles that still exist to a greater or lesser extent in every district are:

> Gas fires of obsolete construction and design, which overheat the air of the room.
>
> Gas fires of any design so fixed that the products of combustion are not completely and freely carried up the flue under any atmospheric conditions.
>
> Gas fires of such design and/or so fixed as to be eyesores instead of harmonizing with their surroundings and making part of a suitable heating unit. (This last has no bearing on the hygienic aspect of the problem, but is mentioned because of its great importance.)

All of these sum themselves up with "ignorance of the possibilities of gas heating at its best, and prejudice due to experience of it at its worst."

The British Commercial Gas Association, within the limits of its means, has for years been doing, and continues to do, much nationally, and can assist undertakings to do their share locally. Wembley did a very great deal to awaken public interest to the facts. It is my firm belief that a great opportunity now presents itself, and that if all give their close attention to this field of development, and take every possible step to educate the public on the possibilities of gas as an aid to health, there will be such an increase in the popularity of gas in the next few years as will far surpass all previous experiences of the industry.

Discussion.

The CHAIRMAN said Mr. Goodenough had touched on a subject that teemed with points of interest, and especially from the municipal point of view was of great value, as indicating the important and practical part which the Gas Department played in the strenuous and persistent fight for better and more healthy communal conditions. It was a happy fact that the work and progress of the gas industry ran parallel with public welfare, and with the solution of such civic problems as air pollution, housing, and domestic economy. The gas industry had played a wonderful part in a quiet and unobtrusive way in providing economic and efficient alternatives to raw coal, as well as in seeing to educating public opinion on this subject through the work of the "B.C.G.A." No more striking testimony to the value of this work could be found than in the present attitude of the medical and architectural professions to the value of gaseous fuel. He desired to draw attention to the splendid part that gas was playing in the municipal exhibition then being held in the Waverley Market, Edinburgh. It was a display of which the Edinburgh Gas Department, as well as the whole Corporation, might well be proud. When arrangements were being made for this District Conference, it had

been intended that the discussion should be opened by Mr. Alfred Procter, the President of the "B.C.G.A." However, Mr. H. E. Bloor was kindly deputizing for the distinguished Chairman of the York Gas Company; and he had pleasure in calling upon him.

Mr. H. E. BLOOR said that Mr. Procter had many reasons for wishing to be present at the conference in Edinburgh. On his behalf, however, he had to extend to the delegates present an invitation to visit York in October of the present year. The intention was to have a conference there on Oct. 1, 2, and 3; and it was hoped to make the various meetings both interesting and profitable. Those of them who were associated with the industry must live-down the thought in the minds of the public that their industry was something worn out, or even out of date. Indeed, it seemed to him that they were entitled to claim that the modern gas fire was a triumph in applied science. It was a highly scientific piece of apparatus, and not a bit of hot iron, like the electric convector heater. The fact that the industry was an old one did not necessarily mean that it was weak. It was up to all of them to demonstrate to the public that theirs was a thoroughly scientific and up-to-date industry. More and more it would be found, as the years went on, that the salesmanship side of the business was vitally important. Therefore it would be realized that the salesman must be armed; and he could not be armed properly unless the concern was technically sound. The works must supply gas as cheaply as possible, the appliances and the distribution must be efficient, in order that a good service to the public might be given. They must consider service to the public first, last, and all the time. It was because of the need for such service that the "B.C.G.A." had sprung into being. The Association had done, and was doing, marvellous work. The service of literature which it provided was splendid; and all of them, he was sure, had found inspiration from the ideas which the Association disseminated far and wide.

Dr. E. W. SMITH said he would like to support Mr. Goodenough in his contention that the industry should aim at enlisting the support of the medical profession. Mr. Goodenough doubtless could have told them of some research work which was being undertaken by Sir Henry Gauvain. Gas was playing an important part in these researches for the utilization of artificially produced sunlight in ameliorative work amongst children. According to his own experience with gas fires of suitable size in a room, people in that room were much more comfortable than they would be with a coal fire, even on the coldest days. At the same time, he had the feeling that if a consumer wanted to buy a gas fire he often found the initial cost of equipment was too high. It was most important that they should make prospective purchasers aware that well-working equipment could be installed for £2 or £2 10s.

Mr. W. M. MASON remarked that the whole object of the conference was to indicate to the general public, through the medium of the Press, the great part the gas industry played in modern commercial life. It was a part that was very often taken for granted. An important part which the industry was playing in the large towns and cities of Great Britain had reference to the smoke problem. As the outcome of one day's fog in Glasgow, it was computed that the death rate rose from 25 to 233. That was a striking instance of what could happen from fog or smoke pollution. In London, statistics showed that, as the soot fall declined, the consumption of gas correspondingly increased.

Mr. H. H. GRACIE (Edinburgh) said that what Edinburgh was doing could not be better illustrated than by the gas exhibit in the Waverley Market. There visitors would see all the latest appliances; while the "B.C.G.A." illustrated the right and the wrong ways of utilizing coal. The latter was a wonderful display, which reflected great credit on the "B.C.G.A." It ought to convert thousands to the use of gas in preference to solid fuel.

Mr. JAMES DICKSON (Dundee) agreed that they should appeal more and more to the scientific mind and scientific attitude of the public. He recognized, however, that one of the chief troubles with which they would have to contend in future would be to give an adequate supply of gas at all times and in all circumstances. He could give interesting figures relative to the undertaking in Dundee. In 1905, for instance, when free cookers were introduced, the output was 600 million c.ft. per annum; in 1909, when free fires were introduced, it rose to 900 millions; and to-day the figure had risen to 1800 millions. In Dundee they had reached the stage of realizing that an adequate and equal distribution of gas was essential. Consequently, they were attacking many of the old properties, and were desirous, so far as possible, of having control up to the burner. They were prepared to supply free services up to the meter, provided the landlord or factor undertook the piping beyond the meter. It seemed to him that this was quite an equitable arrangement. Possibly the Corporation of Dundee might themselves have been to blame for what had happened—if he might be allowed to put it that way. He was hopeful that the policy that was now being proposed would work out to the advantage of the Corporation, the consumer, and the landlord. He could not say that he felt the burden resting too heavily upon him; but neither was he self-complacent. He recognized that there was some work ahead, and that there had got to be a cleaning-up process. He fully appreciated what Mr. Bloor had said in regard to the salesman's point of view. Salesmanship would come to be recognized more and more as the years went by.

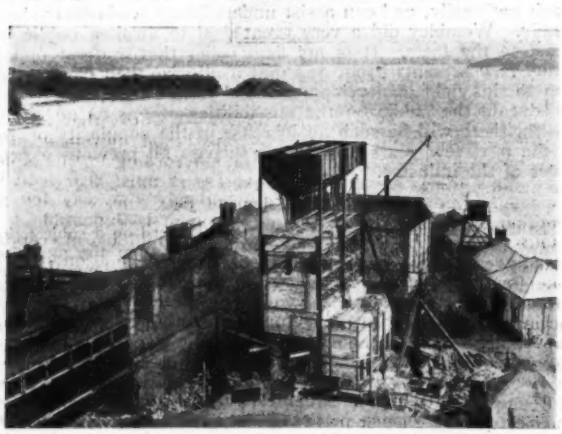
Prof. R. STANFIELD (Edinburgh) said he would like to interpose his opinion as a layman. As a professor of engineering, he had been an advocate and user of gas for many years. Indeed, he was instrumental 35 years ago in introducing a fairly large power plant in which producer gas was used. Since that time he had advocated the use of gas both for power and for domestic purposes. He wondered, however, whether the industry had any control over the kind of apparatus that was being placed on the market.

Mr. GOODENOUGH, in the course of his reply, said the gas industry had no such control; and he did not see how it was ever likely to be attained. It was a point, however, that was under discussion by the industry in conjunction with the Board of Trade. Personally, he was not a believer in supplying free appliances in connection with the gas industry. If money was spent on service and publicity, it seemed to him it could be brought back in even greater measure by supplying the public with what it wanted on sound commercial terms.

This concluded the morning session. The proceedings in the afternoon will be noticed in a subsequent issue.

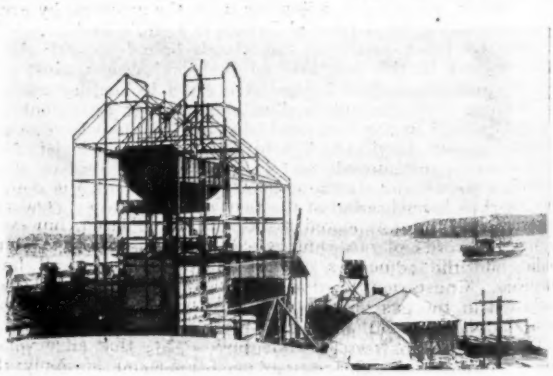
GLOVER-WEST VERTICALS AT MANLY, N.S.W.

The township of Manly—a renowned beauty spot—is situated at the head of North Harbour, in the famous Sydney Bay. The works of the Manly Gas Company, Ltd., lie quite close to the shore; and from the site of the installation of Glover-West vertical retorts at present under construction a magnificent view of the harbour is obtainable, as can be seen from the photographs reproduced.



This photograph was taken on Sept. 27, 1927. The coal bunkers are in position, producers bricked-in, and retort bench brickwork in hand.

The installation will comprise two settings, each of eight 40 in. by 10½ in. retorts of the new model. A hopper of 7 tons capacity will feed unbroken coal through a West double-roll coal breaker; and the reduced coal will pass along a steel guide shoot into a West lip-bucket conveyor, which will completely encircle the bench. When not handling coal, the lip-bucket conveyor will deliver coke to a feed hopper designed to contain 12 hours' supply of coke for the producers and retorts. The capacity of the conveyor will be 40 tons of small coal or 17 tons of coke per hour. A steel shoot will be arranged from the top strand of the conveyor to a battery of outside hoppers for the storage of coke. Bar screens above the hoppers will grade the coke; and the hoppers will have a storage capacity of 60 tons of screened coke and breeze. The coke will be fed from the hoppers by gravity into carts or motors.



By Nov. 8 the retort bench was completed and the steel framework of the house erected.

A 1-ton electrically driven passenger and goods lift will be installed, by which coal can be elevated in small trucks to the bunkers and coke to the producer level, so that the lift will act as a stand-by to the conveyor.

THE PHILOSOPHY OF PROGRESS,

OR INSIDE INFORMATION ON THE CHOICE OF CARBONIZING PLANT.

By H. J. TOOGOOD.

All progress is change, but all change is not progress. To progress is to improve upon the existing, which implies the bringing of something better to add to that which is known. The ancient adage "Necessity is the mother of invention" has been so oft repeated that it is generally accepted as an axiom. (Such is the doping power of constant repetition.)

That new knowledge comes to those who seek rather than to those who need is a truth we all must have experienced. Hence we may modernize this truism and say, that granting that necessity be the mother of invention, then "The desire to serve" is the father of the inspiration to invent.

Again, "Knowledge is Power" is a slogan so often sung that its half-truth nature is lost in the rhythm of its repetition. If knowledge be power, then the British Museum, the greatest storehouse of the world's wisdom, ought to be the greatest power-house on earth, which it is not. Hence the whole-truth we sadly learn is "Knowledge is but Potential Power."

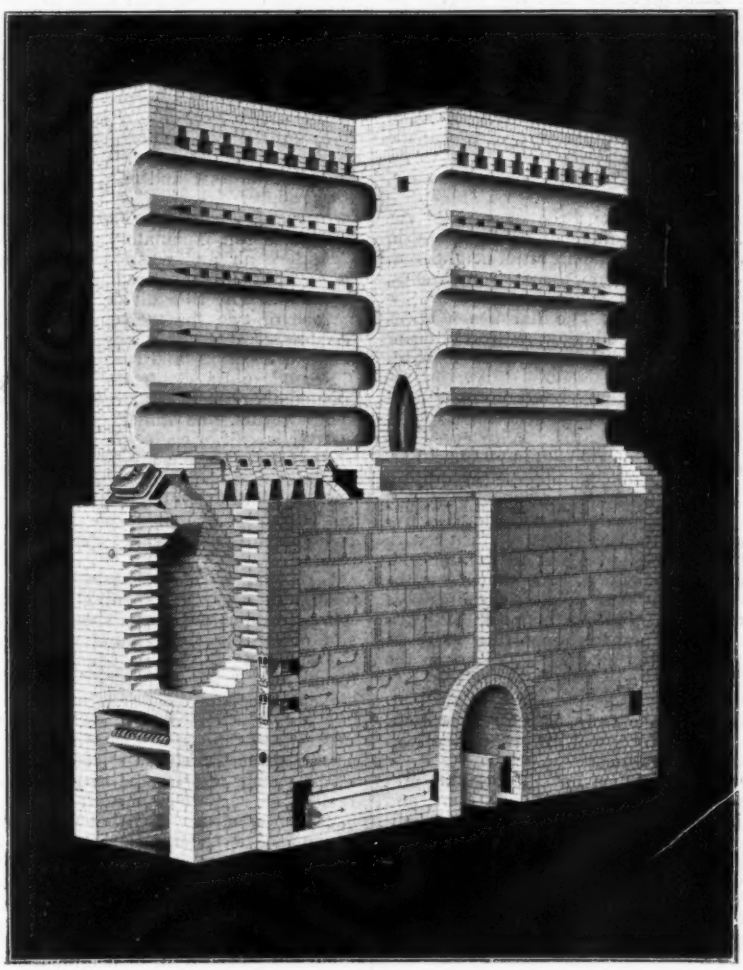
Evolution, we were taught, depends upon the "survival of the fittest." This doctrine of destructive evolution, rendered venerable by time, appeared to be reliable. Tried, however, with the records of our century-old gas industry, we find no bodies of unfit principles of carbonization, whence all have survived. Consequently, since there has been in fact great evolution in the gas industry, we must reject this Darwinism as a guiding principle, and as destructive to initiative.

To take analogy from Shavian philosophy—that all development is made through creative evolution—and to apply the theory to industry, we find: Considering the romance of commerce, we recall how the Merchant Venturers took their merchandise and sailed uncharted seas, through which risk and daring was born and developed the boon of the world's commerce.

Considering industry, the trader's first thought is of something to market. He then applies his mind to produce. He risks its manufacture, and so again, by the spirit of adventure, trade is nurtured and continues to flourish. Thus, we begin to see how this "urge to adventure," which more or less pervades all living organism, is the germ of all invention and progress.

MODERNIZED CARBONIZATION.

The complex of modern carbonization, however, wherein each phase of its many efficiencies is struggling for its natural self-expression, shows up that this theory of creative evolution alone admits of the development of each and every individual urge, and co-ordinates all individual efforts to serve, to the fullest benefit of the public utility of the gas industry. As example, at this moment politicians, physicians, public flotations for low-temperature carbonization, foreign competitors, coke oven companies, and even, to an extent, the coal industry itself, are clamouring for some advance towards that ideal a smokeless atmosphere—and all by one broad movement, the abolishment of the domestic coal fire. According to this philosophy, this world-wide desire or expression must bear fruit in inspiring invention, and must also prepare the way for its adoption, without which factor development is impossible.


POROUS BRICK INSULATION.
STRAIGHT JOINT TO RENDER INDEPENDENT EACH SETTING.
PATENT ELLIPTICAL COMBUSTION CHAMBER ARCHES.
ALL NOSTRILS BROUGHT INTO VISIBILITY.
SLIDING FURNACE CHARGING DOOR.
CURTAIN WALL & CONSTANT DEPTHS OF FUEL.
PATENT NON-CLINKERING SCREEN-BAR-GRATE.
FURNACE CONTROLLED BY P.G. DAMPERS.
NO ASHPAN DOORS NEEDED.
SILICA EXPANSION ACCOMMODATED.
PATENT FLAT BENCH COVER. BUILT OF STANDARD SHAPES THROUGHOUT.
BUILT-UP 95% SILICA RETORTS.
BONDED AND INSULATED BENCH FRONTS.
PATENT 2-PLY, 2-ROW, TUBULAR REGENERATOR.
W.H. & S.A. CONTROLLED FOR EACH ½ LENGTH OF RETORT.
CONTRA-FLOWING STREAMS OF W.H. & S.A. SEPARATED BY 2 THICKNESSES OF FIREBRICK. ALL LEAKAGE THEREBY ENTIRELY PREVENTED.

"DEMPSTER-TOOGOOD" MODERNIZED HORIZONTALS.

Outside of the gas industry we see millions of capital actually expended in the endeavour to produce economically coke (smokeless fuel) to replace the 40 million tons of coal annually consumed wastefully in domestic coal fires. Within the industry there is a tremendous awakening to the unlimited importance of its secondary product—coke—to solve this great national need, the substitution of coke (smokeless fuel) for raw coal. So much so, that the opinion has already been voiced that consequential upon greater coke sales, the prospects of cheaper gas were never more hopeful than now.

Chief among the features co-acting for cheap gas into holders from horizontal retorts is the operation, one on the other, of the following fundamental factors: Cheaper coals and higher coke sales per ton of coal carbonized, as instance: Horizontals will deal indiscriminately well with all sorts and conditions of coal. This outstanding feature broadens the base of coal markets, and consequently commercially cheapens the first cost per

ton (an item for deep consideration in face of the projected Coal Selling Organization). Horizontals yield relatively increased weight of coke for sale per ton of coal carbonized, which means, on balance, that the net cost of coal figures at an extremely low rate. This resultant remarkably cheap gas or gaseous therms into holder has formed the subject-matter of several recent papers before the Institution of Gas Engineers. Coupled with these vital considerations, the many detail improvements which go to make up that over-all efficiency-in-use are worthy of the closest consideration for any scheme of choice of carbonizing plant.

In sympathy with this philosophy, the accompanying photograph giving an inside view of a partially-built modernized horizontal retort setting and regenerator producer (developed by Messrs. Robert Dempster & Sons, Ltd., of Elland) is worthy of the attention of progressive engineers.

Main Arch.—The function of the erstwhile main arch was to cheapen the cost of periodic renewals of the retorts and settings. With the improvement in refractories, the periods of repairs have become so infrequent that, coupled with the increased size of the modern setting (which relatively dwarfs the main arch), the economic phase has changed so that it is cheaper and better to substitute a flat dead-weight bench cover for the main arch.

This new-departure introduces several signal advantages—viz.:

(1) Efficiency increased; there being less mass brickwork to maintain at the modern high temperature of carbonization.
(2) Economy of construction; no arch-bricks being necessary, and no cutting to suit curvatures of arch.
(3) Individuality given to each setting; the absence of the main arch permitting the advantage of a straight open joint to render each setting independent of its neighbours.
(4) Cheaper ironwork. There being no thrust from arches, the bench bracing is economized.
(5) Absorption of silica expansion. The flat bench cover simply rises exactly to accommodate growth of interior silica, while always buttressing the top retorts, to work with modern stoking machinery.

Retorts.—As is well known, iron retorts were originally used in the gas industry, and were worked at (say) 800° to 1000° C., and had a working life of some nine months. With every improvement in the refractory nature of the retorts, higher carbonizing temperatures were used, to the increase in over-all efficiency, so that to-day temperatures of 1400° C. are applied to the retorts, and the working life has gone up to four or five years. Thus it may be said that the gas industry started with low-temperature carbonization, and developed to greater efficiency by high-temperature carbonization. As shown on the illustration, the retorts are built up from 95 p.ct. silica specials close-jointed with prepared silica jointing material. Of the retort, 60 p.ct. is exposed to flues, and the supporting walls are relatively close pitched, to reduce the mechanical strain on the silica spanning between the walls.

Stay-Walls Supporting the Retorts.—These are of 95 p.ct. silica, both between and outside the rows of retorts, so that, with the upward expansion, the retorts will lift on an even keel and better retain their gastight qualities.

Absorbing Expansion of Silica.—Silica has the peculiar properties of almost sudden expansion at less than red heat, and after, of a second expansion and a slow growth, due to chemical change from prolonged heating. This two-fold expansion is neatly absorbed by corrugated cardboard inserted during construction between the stay walls and the pier walls. The silica of the interior walls and retorts can therefore act as one mass. The cardboard in its cold state first being crushed gives the necessary first easement, and afterwards burns away to give the second easement.

Heat Transmission.—Ninety-five per cent. silica at modern high carbonizing temperatures, relatively to firebrick, has a higher coefficient of heat conductivity, which, coupled with its higher refractory nature, enables the heaviest charges of slack coal to be burned off in economic and regular periods of time, and with the utmost economy of coke as fuel.

Combustion Chamber Arches.—The complete elliptical shape, with perfect abutments formed as the keystones of the producer arch, ensures the maximum of strength, circumscribes the inner cone of the flame of combustion with minimum impingement, allows of a steady and more undisturbed flame development than any other shape of arch (to the advantage of everyday working), and also gives better access at times of repair.

Producer Arch.—This has a central row of nostrils. Its keystone cannot be displaced by expansion thrusts, being held by the formation of the superimposed combustion chamber arches; and the nostrils of both producer gas and heated secondary air are thereby brought into visibility.

Producer.—That gas-works utilize their own coke (smokeless fuel) to maintain with utmost economy the great volume of high-temperature heat required is virtually unknown to the lay mind. Realization of this fact should entail careful consideration of any improvements in this vital feature, particularly as the producer is the driving force of efficient carbonization.

Non-Clinkering Screen-Bar-Grate.—The essence of this improved grate consists of an inclined grate (having no steps or projection) housed within three virtually vertical walls, whereby each piece of coke must gravitate to the grate down which it slips and creeps as it is gasified; the contained ash being encouraged by the creep to fall into the ashpan before any agglomeration of coke or clinker formation can arise. Thus, the clinkering period being non-existent, the heat units poured into the settings are rendered more uniform both qualitatively and quantitatively, to the advantage of regularity of carbonizing heats, economy of fuel consumption, and better amenities for the men.

Constant Depths of Fuel.—The brickwork is formed as a curtain, so that, regardless of the quantity of fuel on the fire, the several depths of incandescent fuel between the grate and the producer gas outlet remain constant, with obvious advantages.

Twin Producer-Gas Flues and Dampers.—The above curtain allows of introducing two producer-gas dampers. Thus the producer gas is exactly controlled to each half of the setting.

Ashpan Doors.—Consequent on the introduction of the above producer-gas dampers, no ashpan doors are necessary. Thereby a great simplification of control of heats is established, since (as compared with three media to control—viz., primary air, secondary air, and waste heat) there are now practically only two—viz., secondary air and waste heat.

Insulated Furnace Charging Door.—This door is characterized by the fact that the machined sealing faces of both door and frame remain always in contact, whether open or shut. It readily slides horizontally into its respective positions. Therefore, as it is retained at more even temperature, the tendency to warp is reduced, to the advantage of its gastight qualities, reduction in wear and tear, and improvement in the quality of the producer gas.

Two-Ply, Two-Row, Tubular Regenerators.—The illustration is almost self-explanatory. The contra-flowing streams of secondary air and waste heat are contained in neatly nested tubes built in staggered formation to maintain mechanical strength. The thin divide for maximum heat interchange is formed of two thicknesses of firebrick. Hence leakages are absolutely prevented. The tubes are large and horizontal, to admit of cleaning and repairing from the front wall.

Secondary-Air Control.—The regenerators are so compartmented that the secondary air is controlled by external screw slides within fine limits, and heated and delivered to each quarter length of each side of the retort setting.

Waste-Heat Control.—Similarly, by dampers in readily accessible positions, and within easy reach for inspection, the vacuum or draught controlling the waste heat from each quarter length of each side of the setting is regulated, so that combustion is under exact control throughout the length of the retorts.

Insulation for Heat Conservation.—Efficiency of porous brick insulation being at the maximum at low temperatures, it is axiomatic that the bricks should be applied as near to the outside of the brickwork mass as practical considerations allow. Consequently the whole bench-top is paved with porous non-conducting bricks, thereby saving fuel and rendering the stoker's working conditions more comfortable.

Front Walls of Setting.—Consequent on the close grouping of so many retorts, the word walls is a misnomer, the front of a setting, accurately described, being but brick filling between neighbouring retorts, and between retorts and pier walls. This realization is more important than it might at first appear because to build as a wall that which is not a wall, tends (on the expansion of the interior mass) to set up insidious leakage from invisible sources in this outer brickwork. To counteract this tendency, and to provide and safeguard the insulation, this brick filling is built in special manner, thus. The inside and outside faces of this 16-in. filling are of firebrick to withstand wear and tear, and are 4½ in. and 9 in. thick respectively, but alternating each 9 in. of height, thereby forming two mutually bonded firebrick faces 2½ in. apart. Into the interior and zig-zag spaces is built 2½ in. thickness of standard porous insulation bricks. Thus, paradoxical though it may seem, while the inner and outer firebrick faces are bonded one with the other, with the full strength of firebrick, yet the whole area is insulated, without strain on the insulating bricks. This unique construction, formed wholly of standard bricks, covers the joints, introduces maximum insulation, retains without sacrifice the benefits of firebrick bonding, and fulfils its function to the great advantage of lasting economy.

Reduction in Ground Space.—The retorts are in five tiers, which means that the maximum carbonizing capacity is grouped on relatively less ground space—thereby again conserving fuel and reducing capital expenditure per unit volume.

The foregoing deals with the enhanced bench efficiencies of modernized horizontals, to which must be added the advancement introduced by the improvement made in the displacement of ascension pipes by descension (scrubber) pipes, improved stoking appliances, and the dry-cooling, and utilization of the sensible heat, of the hot coke—an explanation of which is beyond the scope of the present article.

To complete this philosophy of progress, it is essential to realize that the desire to serve is as faithfully and exactly fulfilled by buyers, in the studied and intrinsic correctness of their choice of plant, as by designers in the studied and intrinsic correctness of the design of their details.

GAS LEGISLATION FOR 1927.

When noticing in the "JOURNAL" in December the Private Acts directly affecting gas undertakings which were passed in the last session of Parliament, it was mentioned that reference to two measures had to be held over in consequence of the length of time occupied in their passage. Both received the Royal Assent just before Parliament rose for Christmas.

PRIVATE ACT.

WALLASEY CORPORATION.

Various powers are conferred upon the Corporation by this Act. Among other things, the boundaries of the borough are extended so as to include within them the township of Moreton and part of the township of Bidston-cum-Ford. As from July 1, 1928, or such earlier date as may be agreed between the Corporation and the Hoylake Council, the limits of the Corporation for the supply of gas shall extend to, and include, the borough and a portion of the excluded part of Bidston. The Hoylake Urban District Council shall sell to the Corporation the portion of their gas undertaking which is situate within the added areas and within the excluded part of Bidston just referred to; the price stated being £12,500. There are also several other clauses relating to the gas undertaking. The Corporation may specify the minimum size and the material of pipes and fittings. The charge for stand-by supplies is to give a reasonable return, but shall not exceed 5s. in respect of any one quarter of a year in cases where the nominal capacity of the meter does not exceed 120 c.ft. per hour, or 25s. in any quarter where the nominal capacity of the meter exceeds 120 c.ft. but does not exceed 1500 c.ft. per hour. The Corporation may fit-up showrooms.

[*Parliamentary Agents: Messrs. Sharpe, Pritchard, & Co.*]

PROVISIONAL ORDER.

DUNDEE CORPORATION.

A modified draft Provisional Order promoted by the Corporation contains various provisions. Among other clauses is one relating to gas which is in somewhat different form from that which appeared in the "JOURNAL" last March. It now reads:

As to Deficient Supply of Gas to Buildings.—In the event of any occupier of any buildings erected prior to the year 1907 within the limits of the gas supply of the Corporation complaining of a deficient supply of gas, and the Corporation after investigation being satisfied that the complaint is well founded, the Corporation may, after giving twenty-one days' notice to the owner of their intentions, enter upon the said buildings in respect of which the complaint is received, with or without the consent of the owners, for the purpose of renewing or enlarging the gas pipes from the gas main to the meter of such buildings, which work shall be carried out free of cost to the owner; but the Corporation shall not be obliged to make the said renewal or enlargement unless and until the owner undertakes to enlarge or renew to the satisfaction of the Corporation that portion of the private pipe for conveying the gas from the meter to the lighting burner.

Provided that in the event of the owner refusing or delaying to undertake to renew or enlarge the private piping from the meter to the lighting burner after having received notice in writing from the Corporation calling upon him to do so, the Corporation shall have power to enter upon the said buildings with or without the consent of the owner for the purpose of renewing or enlarging the piping from the main to the meter and charge the owner with the full cost thereof, such cost to be certified under the hand of the Gas Engineer and to be recoverable by the Corporation from the owner as a civil debt reserving to the Corporation without prejudice to the foregoing powers all their existing powers under the Gas Acts.

Provided further that nothing in this section shall apply to any piping on the premises (other than in a dwelling-house) of a railway company, nor shall the powers of this section be exercisable in respect of such premises.

Certain residual products clauses, in connection with the manufacture of road construction compositions, were struck out, in circumstances which were fully explained in the "JOURNAL" for July 27 (p. 209).

[*Parliamentary Agents: Messrs. Wm. Robertson & Co.*]

POTENTIAL INVESTMENTS.

VIII.—THE SOUTH SUBURBAN GAS COMPANY.

This Company was incorporated as the Crystal Palace District Gas Company by Special Act in the year 1858, and further powers were obtained between the years 1865 and 1926; the name being changed in 1904. The statutory area of supply covers 145 square miles, and comprises part of the Metropolitan Boroughs of Lewisham, Camberwell, and Lambeth, and the County Borough of Croydon, and the whole of Beckenham, Penge, Bromley (Kent), Orpington, Chislehurst, The Crays, Sidcup, Bexley, Crayford, Dartford, and Erith. The gas consumers number 100,399.

The Board of Trade last year approved an agreement with the South Metropolitan Gas Company, under powers obtained in that Company's Act of 1925, whereby £500,000 ordinary stock in the South Suburban Company was exchanged for an equal amount of 6 p.ct. irredeemable preference stock in the South Metropolitan Company, and also for the supply of gas in bulk by the latter Company, and for various other arrangements for associated working.

The Company has promoted a Bill in the current Session of Parliament to consolidate, with amendments, the provisions of twenty-eight Acts and Orders relating to the undertaking, and also to relieve the Company from the sliding-scale provisions of its Act of 1906 and for other matters. The Bill proposes that the dividends which the Company may distribute shall be regulated by the scheme set out in the Bill, this scheme being similar to that applied to the South Metropolitan Gas Company by its 1920 Act, and to the Commercial Gas Company by its Act of 1927. Under this scheme the Company would be entitled to pay dividends on its ordinary stock at the minimum rate of 5½ p.ct. per annum (called the "basic rate") whatever the price charged for gas; and when the total revenue from the sale of gas in any year or half-year is less than the revenue which would have been received if the amount of gas sold in the year or half-year had been charged for at 11·5d. per therm (called the "basic price"), the difference is called the "consumers' share," and for the purpose of the division of profits an amount, called "the surplus profits," is calculated, being a sum of which the consumers' share is three-quarters. If, and so far as, the balance standing to the credit of the net revenue account permits, a sum not exceeding one-eighth of the surplus profits may be applied in additional dividends to the ordinary stockholders, and one-eighth may be applied for the benefit of the employee co-partners.

The capital of the South Suburban Company as shown by the last accounts is as follows:

	£	£
Ordinary stock (5 p.ct. standard)		1,243,795
Premiums on ordinary stock		14,510
Remaining to be issued—		
5 p.ct. ordinary stock	£156,172	
5 p.ct. ordinary stock or preference stock	500,000	656,172
Total amount authorized		£1,914,477

	£
Loan capital—	
Debenture stock (5 p.ct.)	368,837
Redeemable debenture stock (7 p.ct.)	101,200
Premiums on debenture stock	34,989
Remaining to be issued as debenture stock or redeemable debenture stock	443,428
Total amount authorized	£948,454

Transfer arrangements: Common form. Fee for registration of transfer, probate, death in joint holdings, marriage, power of attorney, or distringas, 2s. 6d. Stocks (separate deed for each class) are transferable in amounts and multiples of £1. Husband's witness of wife's signature accepted, but not *vice versa*. Voting: 1 vote for every £5 ordinary stock. Directors' qualification, £2000 ordinary stock.

Accounts and dividends: Accounts are made up to Dec. 31 and submitted in February; an interim dividend being paid in August. The standard price of gas (10½d. per therm—altered from 1s. 3d. in August, 1926) was increased temporarily in October, 1926, to 1s. 0½d. per therm, until June, 1927. The present selling price is 9·4d. per therm, and the declared calorific value 500 B.Th.U. per c.ft. Dividends on the ordinary stock are subject to sliding-scale—viz., ⅛d. per therm above or below the standard price equals ½ p.ct. in half-year's dividend. By the Special Order of 1926, however, the rate of dividend payable in any half-year under the sliding-scale may be increased to an extent not exceeding ½ p.ct., irrespective of the price of gas. This extra percentage is subject to possible reduction by the Board of Trade in 1931, and thereafter at intervals of five years.

The following table illustrates the progress made by the Company since the year 1903—the period of the war and the

few following years have been purposely ignored in consequence of the abnormal conditions then prevailing:

Year.	Average Gross Selling Price of Gas per 1000 C.Ft.	Quantity Sold. Million C.Ft.	Capital Expended per 1000 C.Ft. Sold.	Gross Profit.	Total Charge for Capital. (a,)	Rate of Ordinary Dividend. P.Ct. per Annum.	Amount Carried Forward and Balance Reserve Fund.
	s. d.		s. d.	£	£	£ s. d.	£
1903 .	2 7	1,269	9 3	46,963	39,787	5 7 5	44,200
1908 .	2 6½	1,346	9 4	47,739	42,009	5 8 4	54,443
1913 .	2 3	2,049	9 11	71,443	76,459	6 0 0 5 3 4(b)	60,691
	Per Therm. d.	Therms.	Per Therm. s. d.				
1923 .	11·05	14,557,793	2 0	85,216	101,904	6 5 0	76,668
1924 .	9·8	15,943,134	2 0	98,442	108,421	6 10 0	68,712
1925 .	10·7	16,855,863	2 0	120,289	118,968	6 10 0	72,473
1926 .	10·87	17,519,271	2 0	123,139	122,015	6 10 0	76,075

(a) Total charge for capital includes dividend and interest paid and amount (if any) carried to reserve fund.

(b) Dividend on West Kent stock converted to ordinary stock in the year 1919.

The principal feature of the above table is the enormous increase in the gas sold since 1903, which equals 176 p.ct. This increase is partly attributable to the fact that the Company absorbed the Bromley and Crays Gas Company and the West Kent Gas Company in the year 1912, and the Dartford Gas Company in 1918. The capital expended is rather higher than is usual for a Company of this size, but of recent years this expenditure has been mostly in respect of the extension of mains and for additional gas appliances on the district, both of which are expected to produce new and profitable business.

The working agreement with the South Metropolitan Gas Company (referred to above) is expected to be of great advantage to the Company; and the future is very promising.

The ordinary stock and the 5 p.ct. perpetual debenture stock are both quoted on the London Stock Exchange; and the following table shows the prices of the highest and lowest transactions on the ordinary stock, the dividends paid, and the yield on the average price during the four years 1923-26 inclusive, and the transactions only for the year 1927.

Year.	Transactions. Highest.	Transactions. Lowest.	Dividend. P Ct. per Annum.	Yield P.Ct. per Annum on Average Price.
			£ s. d.	£ s. d.
1923	105	98	6 5 0	6 3 2
1924	110	97	6 10 0	6 5 7
1925	111	92	6 10 0	6 8 1
1926	101½	95	6 10 0	6 12 4
1927	105½	98⅛	..	..

During the year 1927 the price of the stock improved, and is now quoted 105-108. On the average quotation of 106½, the yield on a £6 10s. dividend is £6 2s. p.ct., and it is therefore an attractive investment.

REACTIVITY OF COKE.

Standardized Method for the Determination of Comparative Values.*

Reviewed by H. M. SPIERS.

This report, just published, contains a full account of the work so far carried out at the Fuel Research Station on the subject of the reactivity of coke. Some of the information now presented has already appeared in the Technical Press ("JOURNAL," March 16, 1927, p. 672), and formed the subject of Dr. King's contribution to the discussion which followed the paper on "Coke in Relation to some of its Industrial and Domestic Uses," communicated by Messrs. Hollings and Siderfin last year at the joint meeting of the Fuel Section and the Yorkshire Section of the Society of Chemical Industry.

After a brief historical survey of the work carried out by other investigators on the subject of coke reactivity, a very comprehensive description is given of the apparatus employed at the Fuel Research Station, with full details as to its manipulation under strictly standardized conditions.

Investigations which have been made on the subject of coke reactivity may be divided into two groups, depending on whether the work has been carried out on large or relatively large amounts of material in the massive form, or, on the other hand, on a purely laboratory scale in apparatus holding but a few grammes of the powdered material. The experiments on which the report is based fall into the latter category; and though such experiments give broad indications as to the manner in which reactivity varies with the nature of the coal carbonized and the carbonizing conditions, a large number of additional factors come into operation when the question arises as to the suitability of a particular type of coke for a specified industrial application.

The method for studying reactivity employed at the Fuel Research Station involves the determination of the volume of carbon monoxide produced when 100 ml. of purified carbon dioxide is passed over powdered coke at a temperature of 950° C. The coke is ground to pass a 10 mesh and remain on a 20 mesh I.M.M. sieve, and occupies a length of 7·5 cm. in the silica tube in which the determination is made. The rate of passage of the carbon dioxide is 5 ml. per minute. Three types of reactivity are distinguished.

Reactivity I.—The nearest practicable approach to the initial value of the reactivity of a sample. For its determination, the sample is heated to 950° C. in a stream of nitrogen, passage of nitrogen is continued for a further hour, and is followed by 100 ml. of carbon dioxide. The actual determination, in which a further 100 ml. of carbon dioxide is passed over the coke, is then made.

Reactivity II.—If nitrogen be passed over the sample for a period longer than that just specified, a progressive fall in reactivity occurs; but the rate of decrease of reactivity ceases to be appreciable after passage of this gas has continued for five hours. If the reactivity be determined at the end of this period, a value designated Reactivity II. is obtained.

Reactivity III.—After the standard test for Reactivity I. has been made, passage of successive 100 ml. volumes of carbon dioxide over the sample gradually lowers the reactivity until a value is obtained which remains sensibly constant over several determinations. This relatively constant value represents Reactivity III. Its magnitude has never been found to be greater than that of Reactivity II.; and it may be determined either directly or subsequent to the passage of nitrogen to determine Reactivity II.

It has been ascertained that the three reactivity values found for any sample of coke are quite definite and reproducible. In some cases reactivation has been observed when experiments have been interrupted overnight and then resumed. This phenomenon is at present without explanation; but future work may throw some light on it.

As regards the application of the results to industrial operations, it is stated that much more work is required before any explanation can be given as to the real meaning of the observations; and with this view there will be general agreement. However, one definite fact which has been established is that, in the blast furnace, low reactivity seems to be desirable; and the report shows that cokes with a low reactivity shatter less readily than do specimens with a higher reactivity. It would therefore appear that a good shatter test is characteristic of good furnace cokes, and that reactivity should be low. Nevertheless, it must be pointed out that it is questionable whether determinations carried out at a temperature as low as 950° C. can give results comparable with working conditions in the blast furnace, where temperatures of a much higher order prevail.

A further point which must be emphasized in connection with the adoption of 950° C. as the standard temperature is the applicability of the method to the study of the reactivity of low-temperature cokes, since the sample under test is submitted to preheating at a temperature of 950° C.—a temperature much higher than that ruling during carbonization. The authors are, however, fully cognisant of the limitations of the method for this particular purpose.

The present report maintains the high standard which has always been characteristic of the investigations undertaken at the Fuel Research Station; and in this case there is to be taken into account the additional fact that the work was carried out in co-operation with the Fuel Economy Committee of the National Federation of Iron and Steel Manufacturers. The results to be obtained from the experiments still to be carried out will be awaited with keen interest by all concerned with the scientific application of coke; and they will be the more valuable if the data are accompanied by full information as to the treatment of the coal, the physical and chemical properties of the coke, and the nature, composition, and distribution of the ash. It is only by taking into account all the factors which may exert an influence on the issue that real progress will be made in the very difficult problem which is being studied in so many laboratories.

* "The Reactivity of Coke. (1) Standardized Method for the Determination of Comparative Values," by J. H. Jones, Ph.D., A.I.C., J. G. King, Ph.D., A.R.T.C., F.I.C., and F. S. Sinnatt, M.B.E., M.Sc., F.I.C., Department of Scientific and Industrial Research, Fuel Research. Technical Paper No. 18. London, 1927; His Majesty's Stationery Office, Adastral House, Kingsway, W.C. 2. Pp. VI. + 32, price 1s. net.

ELECTRIC WELDING REPAIRS TO INFLATED HOLDERS.

A subject of particular interest at the present time to the gas industry was discussed at a meeting on Monday, Jan. 23, of the Institution of Welding Engineers, when Mr. A. E. Plumstead, of Messrs. A. E. Plumstead & Co., Ltd., Welding Engineers, Norwich, read a paper entitled "Electric Welding Repairs to Inflated Gasholders," which was copiously illustrated by lantern slides—most of them depicting actual repairs in course of being carried out. The chair was taken by Prof. E. A. Atkins (Director of Research at the Pearson & Knowles and Rylands Bros. Laboratories, Warrington), who is a member of the Council.

The author, at the outset, referred to the paper read in April, 1926, by Mr. Joseph N. Reeson, Engineer-in-Chief to the Metropolitan Gas Company of Melbourne, before the Institution of Civil Engineers on "The Influence of Electric Welding on the Design and Fabrication of Gas-Works Plant and Structures" (an abstract of which will be found in the "JOURNAL," Vol. 174, p. 97), and to the recent mishaps to holders at Folkestone, Manchester, Truro, Pittsburg, and Southport. His object was to demonstrate as clearly as possible the advantages of electric welding repairs applied to gasholders, and to prove that, with the correct method, and competent operators, it is a definitely safe and practical proposition. It is his belief that he was the first person in this country to repair gasholders by the electric arc welding process; and the work had been executed in each case on holders which contained gas, and were in service.

EXTERNAL CORROSION.

In some cases Mr. Plumstead has observed that undue friction exists between the roller guides and columns, thereby restricting free movements of the holder. With spiral-guided holders, the guide wheels have been found to be immovable, due to rust, &c. These defects, in conjunction with the expansion of the holder in hot weather, cause the plates to distort and vibrate, occasionally resulting in loose rivet seams and fracture of protective covering. He has also observed holders constructed of plates from which the scale has not been removed, resulting in constant peeling and exposure. In some cases the tape used for rivet seam jointing is of poor quality, which is responsible for rust accumulation and subsequent wasting of plates adjoining. Hence naked portions of the holder plates are exposed to the weather, and, with the rise and fall of the holder, to the water in the seals and tank.

MATERIAL FOR HOLDER PLATES.

It is the author's opinion that greater attention generally is paid during construction to foundations, structure supports, &c., than to the actual gas envelope; and he thinks that more care should be given to the prevention of deterioration of the plates, bearing in mind that gasholders are expensive to instal, and of light construction as compared with dimensions and length of service required. His view is that holder plates should never be less than 10 gauge, in order to provide for a long period of sound condition; and they should also graduate in thickness from such parts as the curb and crown plates, butt straps, &c. There is a difference of opinion with gas engineers regarding the most suitable type of plate for holder construction; pure iron plates being most favoured. Mr. Plumstead's view is that iron plates were probably the best material (say) 20 years ago, but that at the present time the quality of iron is not so good as formerly. This is particularly noticeable during cutting and welding, when slag inclusion and lamination are frequently visible. Therefore he suggests that mild steel plates of known good quality, low carbon content, annealed and flattened, and free from scale are the most suitable for holder construction at the present time.

ELECTRIC ARC WELDING

Welding repair by the electric arc process is, said the author, generally practicable and safe when applied to inflated coal gas holders constructed of 10 gauge or thereabouts. There would be no gas explosion in a burning building. If the gas pipes become red hot and collapse or break, the gas merely continues to burn until the main is closed. Similar conditions, on a minute scale, regarding the area of the heated zone, apply to exterior electric welding repairs to inflated coal gas holders; and it is perfectly safe to produce a red-hot condition of plate at the point of welding. Escaping gas from possible surrounding leakages may become ignited, and will burn in the same manner as an ordinary gas jet, until extinguished. The only danger that could arise would involve a parting of the gasholder plates over a large area, causing them to collapse, and thereby allowing an inrush of air which would produce an explosive mixture in the holder. So that if, prior to the welding, care is taken in stopping existing leakages with suitable material and methods, and extremely weak portions are strengthened mechanically, no apprehension need be felt by those concerned.

The plant requisite for electric arc welding consists of an electric generating set, suitable metallic electrodes, and apparatus for cleaning the plates prior to welding. Expert operators are essential; and they must be familiar with vertical, overhead, and horizontal welding on thin materials. Experience in the manufacture and installation of gas plant is a valuable asset, as this work gives the operator a useful knowledge of conditions of safety in dealing with gas containers, air mixtures, &c. A knowledge of oxy-acetylene welding is also of great service, for heating plates prior to bending, flanging, &c., and for cutting the plates to the required size. The operator must be a good craftsman, confident, fearless, and industrious, a good climber, and ingenious in dealing with leakages and other difficulties.

STORING GAS UNDER PRESSURE.

In the course of his paper, Mr. Plumstead remarked that, while methods of gas manufacture have been continuously improved, it is noticeable that means of storing gas have changed very little. He therefore suggested that extended consideration should be given by gas engineers to the system of storing gas under pressure in a battery of suitable containers, possibly located underground, with consequent saving of works area and the disappearance from the landscape of the enormous gasholders of various types, and their attendant defects—bearing in mind that the increasing consumption of gas will necessitate the installation of larger holders, which in some cases are now being built of 15,000,000 c.ft. capacity.

WELDING IN MELBOURNE.

Proceeding to show his slides, the author said that, as he was under the impression that Mr. Reeson was the first to repair and construct gasholders by the electric arc welding process, he would begin by dealing with his work. The first photograph was of a 3,000,000 c.ft. three-lift holder, of all-welded construction. The holder and structure contain 600 tons of material. Large plates are used—$\frac{1}{8}$ in. thick by 8 ft. by 4 ft., double lap welded; and there are approximately 15 miles of seam welding. There are no rivets or tape joints. This holder was completed in 1922. Later another holder, of $2\frac{3}{4}$ million c.ft. capacity, was constructed at Fitzroy; the total weight of material being over 760 tons. To save welding costs, 18 ft. by 4 ft. plates were employed. About 1923, Mr. Reeson repaired at Fitzroy the crown of a small holder, 80 ft. in diameter; and a slide showed the edge of the new superimposed crown welded to the curb plate.

The next photograph illustrated repairs in 1924 to a holder at North Melbourne. Workmen were engaged in drilling and bolting a small patch-plate to the side of the holder when by mischance the leaking gas became ignited; and the workmen and fire brigade were unable to extinguish the flames, which gradually died away as the holder lowered itself into the water. The side sheets were damaged so badly as to make the upper lift useless; and it was therefore decided to couple together the upper and lower lifts.

REPAIRS TO A NORWICH HOLDER.

The next method of repair described differed from those of Mr. Reeson, in that the repair plates are welded to the actual holder plates over the defective portions and not superimposed. Pictures were thrown on the screen of work done in connection with No. 3 holder at Norwich, the capacity of which is 800,000 c.ft. The plates added to the crown of this holder numbered 87. A report of the Leeds University on samples of single lap-welded joints on 10 gauge mild steel plates showed the strength of the joint to be 97·5 p.ct. of that of the plate, with an average breaking strain of 20·51 tons per sq. in.

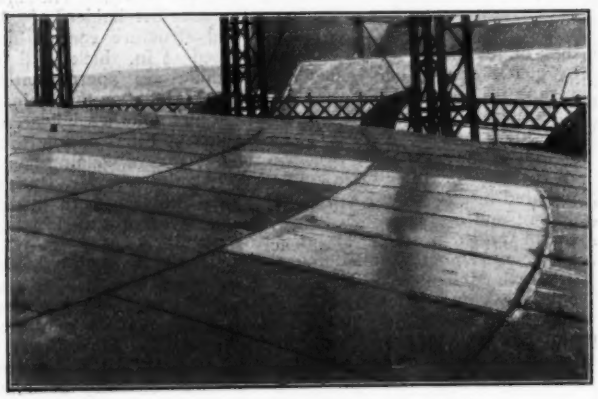
CONCAVO-CONVEX PLATES.

Mr. Plumstead then went on to explain that, in preparing for welding, leakages (if any) are checked, and the plates cleaned on each side of the part to be welded. From a drawing, it was seen that the plate used is convex in shape; dotted lines indicating a slight curvature, which is produced by heating the edges, preferably by oxy-acetylene flame, to the desired extent. This heat-treatment being local on the edge, and the plates thereby being unable to expand conjointly with the heated zone, sets up an expansion-compression effect, and on cooling contraction takes place, resulting in slightly shortening the edges and producing the desired curvature. Mr. Plumstead has secured patent rights for this process of producing concavo-convex plates. The next slide illustrated the edges of the plate pressed down and tack-welded while retaining the curvature; and the following one depicted the plate in its former flat condition, with the welding completed—this result being automatically attained by the contraction of the edge weld to the structure to which the plate is applied. It is, said the author, obvious that this method of preparation relieves the structure of welding contraction strains. This is

always necessary—particularly on thin sections adjacent to rivet seams. The curved plate is cut to size and shape by the oxy-acetylene or oxy-coal gas cutting blowpipe.

A photograph of seven plates welded to the crown of the Norwich holder showed the added plates to be butt-welded to the inner circle plates, lap-welded to each other, slightly off-set, set-down, and welded to the outer circle plates, so as to cover wasted portions at the rivet line. In other pictures the comfortable working conditions of the operators were noted. Electrically driven welding plants are, the author thinks, the most suitable for work of this nature, as they run smoothly and continuously, leaving the operators entirely free to devote their whole attention to the actual welding repairs. A current regulator close at hand enables the operators to adjust the

Norwich Holder.
Operator welding small patch to crown of inflated holder.



Norwich Holder.
The repair of the group of seven crown plates.

energy to suit varying conditions, without having to go to the welding set, which is located on the ground.

A Folkestone Holder.

Repairs to a Folkestone holder in 1926 (during which work, it will be remembered, there was a mishap) were next dealt with. There were five very bad vertical seams on this holder. For the repair of these seams, 10 gauge mild steel plates were formed into a flanged channel approximately 2 ft. wide by 2 in. deep; the length being the same as the holder plates. The channels were welded to the structure at the flanged edges and cross-wise one to another. The top and bottom channels were closed-in and welded to the structure to make the repair complete and gas-tight. Two similar channel repairs were completed on the same holder in 1927. Mr. Plumstead emphasized the fact that the repairs should proceed, from the crown plate downwards, in order that the remaining defective portions are immersed in the water seal for protection.

At Sandringham.

Another job illustrated was the welding of a holder on His Majesty the King's estate at Sandringham. This holder was many years old and in poor condition; the plates having originally been only 16 gauge. Nine plates in all were applied to this holder. Some miscellaneous slides included one reproducing the editorial on "Gasholders and Explosions" which appeared in the "Journal" for Nov. 23 last.

Discussion.

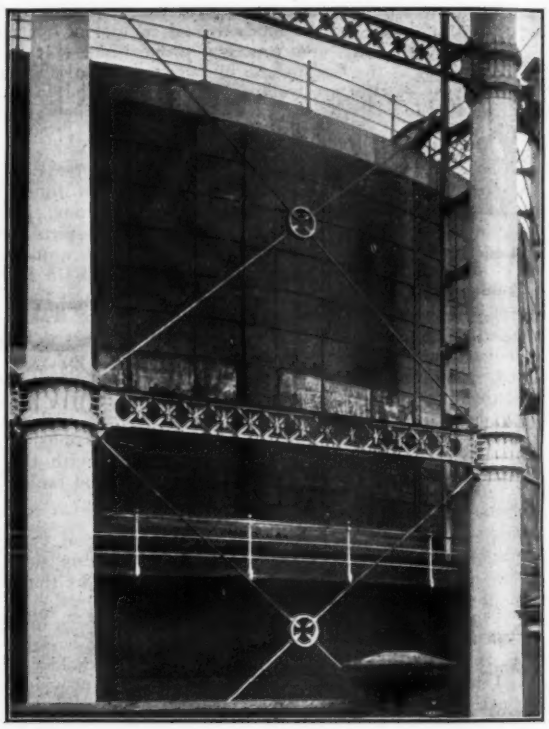
Mr. S. M. Milbourne said it would be interesting to have relative costs of welding and riveting patches, &c., on holders. He would also like to know whether the welded joints would be liable to corrode more easily than riveted ones.

Mr. Plumstead replied that it was difficult to estimate for repairs, because of the varying conditions with which one had to contend. There might, for instance, be heavy rain for several days on end, which would prevent the carrying on of the work; but still the men would have to be on the spot. There were also other conditions liable to variation; and it seemed to him that for these particular jobs the fairest and best way was to arrange for payment of the actual cost of materials and labour, *plus* a reasonable profit.

On the Question of Cost.

Mr. D. Cleave Cross asked what, supposing a new holder was erected, would be the comparative costs of welding and riveting? Would it be very much dearer to weld all the plates in the first instance?

Mr. Plumstead remarked that this was a question he asked Mr. Reeson at the time he read his paper before the Institution of Civil Engineers in 1926; but to the best of his recollection Mr. Reeson did not answer it. Personally, he (the speaker) had not been con-



Folkestone Holder.
Illustrating the completed repair of the most defectiv vertical seam.

cerned with the construction of holders, but only with the repairing of them. As a welder, he would say that the welded holder would be both better and cheaper, because there would be no rivets and bad joints to help towards corrosion.

The Chairman pointed out that a year or two ago there were two welded ships built; and it was clearly and definitely proved that the all-welded ship cost more to build than the riveted ship. But it was also stated that the extra cost was in some measure due to a good deal of prejudice on the part of platers and others who were building the ships. Personally, he believed that in the course of the next few years welded constructional work—whether in the form of ships, buildings, or gasholders—would be carried out at a cost quite comparable with riveted structures.

Mr. W. T. Kenshole inquired whether there was any effect from the heat in the immediate vicinity of the welds.

Mr. Plumstead said the heat of the electric arc was so local that it had scarcely any effect at all upon the neighbouring plates.

Mr. Milbourne repeated his question as to whether a joint would corrode more quickly after welding than if the holder had been repaired by riveting.

Mr. Plumstead said he did not see that there was any possibility of a welded joint suffering from corrosion, unless it lost its covering of paint. The weld really formed part of the structure of the sheet, so that he did not see there was any cause for corrosion.

Rustless Iron or Stainless Steel.

Mr. A. J. Hoare remarked that corrosion could be avoided by employing rustless iron or stainless steel. The initial cost would be very much higher; but this extra outlay would be justified by the lifetime of the holder, while there would be little cause for leakage, which had to be paid for by somebody.

Explosions.

The Chairman, referring to recent holder mishaps, said he was quite sure that no explosion had occurred unless there had been a mixture of gas and air in some way or other. In all cases where explosions had been thoroughly investigated, these had been found, with one exception, to be due to a mixture of gas with oxygen or

air. The one exception was with regard to acetylene. If this was heated to a high temperature in a confined space, it would explode, because it dissociated into other gases. This, however, was not the case with coal gas.

THE CORROSION PROBLEM.

The question of corrosion had been raised. This was the most difficult problem in the world. Those present who had studied the subject of corrosion would know that it was always set-up where one got any diverse conditions. If there was corrosion, he thought it would be found, not on the joint, but alongside the joint, on the plate. This was where it would be necessary to watch. Nothing would accelerate corrosion of mild steel like putting it under strain; and when one part of a plate was heated, the other part was put under strain. He remembered having submitted to him a sheet cut-out of a big gas meter which had been in use for a very great number of years. He was asked what there was in that particular material which enabled it to remain in good condition for so long a period. Examination showed that it was charcoal iron tinned. There was no material which would stand up better than this. But at the present time one could not get it in the form of plates or sheets without paying an enormous price for it. All he could suggest in connection with the use of mild steel plates was that they should be careful that there was no strain on them when in position, that they should see that all the scale was removed before painting, and that they had been properly annealed. He was afraid that if a gasholder was plated with rustless steel it would absorb all the money that a particular town could supply to put it up; and then the people would be astonished, if they went to look at the holder after a year or two, to find it had corroded away. Stainless steel must be kept polished to resist corrosion. If they could obtain the very best form of wrought iron—which they could not—it would not corrode at all.

Mr. PLUMSTEAD pointed out that in his paper he specially suggested "mild steel plates of known good quality, low carbon content, annealed and flattened, and free from scale" as being the most suitable for gasholder construction at the present time. In acetylene welding the area of heat diffusion, which depended on the thickness of the plates, was twice that of the electric arc; so they were bound to get twice the amount of expansion, and consequently of contraction.

The CHAIRMAN said the author had opened-up an extremely important subject. It seemed to him that, for gasholders, there were very great possibilities in the process referred to, if it was carried out with ordinary care. If he were asked to do any welding on any part of a gasholder that was down, he would not comply until he had been assured that it had either been completely filled with water or that air had been blown through it for a considerable period. This was the only safe course to adopt.

SEA AIR AND CORROSION.

Mr. T. B. LANE inquired whether sea air would have any effect on corrosion.

The CHAIRMAN: It is always more intense on the sea coast than elsewhere.

Mr. PLUMSTEAD said he agreed with this; but, at the same time, in the case of the Folkestone holders, though they were near the sea, only one was bad, while the other two were good. Possibly the latter were made of better plates.

GAS BILLS FOR 1928.

(*Concluded from p. 152.*)

TOTTENHAM DISTRICT LIGHT, HEAT, AND POWER COMPANY.

The main object of this Bill is to provide for the transfer to the Tottenham District Light, Heat, and Power Company of the undertaking of the Waltham and Cheshunt Gas Company, the area of which adjoins that in which the Tottenham Company are selling gas. The issued capital of the Waltham Company now consists of 2000 original shares of £10 each, entitled to a standard dividend of 10 p.ct. per annum; and 3807 additional shares of £10 each, entitled to a standard dividend of 7 p.ct. The standard dividends on these ordinary shares are subject to increase or decrease in accordance with the decrease or increase below or above the standard price of 19d. per therm; and the price at present charged by the Company for gas to ordinary consumers is 14d. per therm. The Company have issued 4 p.ct. debenture stock to the nominal amount of £17,750, and redeemable debenture stock to the nominal amount of £7075 bearing interest at the rate of 7½ p.ct. The price now charged by the Tottenham Company for gas supplied to ordinary consumers is 9·4d. per therm. The Waltham Company have agreed to sell their undertaking to the Tottenham Company upon the terms set forth in the Bill. The date of transfer is to be the first day of July or the first day of January next following the date of the passing of the Act. Each holder of 10 original shares of £10 each in the Waltham Company will receive in exchange £156 17s. 3d. of "B" consolidated ordinary stock of the Tottenham Company to be created as provided by the Bill; and each holder of 10 additional shares of £10 each is to receive £109 16s. 1d. of such "B" consolidated ordinary stock—and so on in proportion for any less number of shares. The holders of the debenture stocks will receive the same amounts of similar debenture stocks (subject, in the case of the redeemable stock, to the same conditions) in the Tottenham Company. The necessary stocks to carry out this scheme are to be created on the date of transfer. There is provision for paying in cash fractional parts of £5 of "B" consolidated stock; the value of any such fractional part of stock being calculated at the market price of such stock on the date of transfer. Notwithstanding the repeal by this Bill of any enactment empowering the Waltham Company to raise money by the issue of ordinary or preference shares, the Tottenham Company may at any time after the date of transfer exercise all or any of such powers, so far as the same shall not have been exercised at the date of transfer.

The Directors of the Waltham Company are to receive a sum equivalent to seven years' purchase of the annual remuneration (with the income-tax thereon, if this was paid by the Waltham Company) of the Board for the year 1926; the sum to be divided among them in such proportions as they may agree. The Auditors holding office at the date of transfer are to be paid three years' purchase of their remuneration for 1926. The Engineer, Manager, and Secretary is to be paid by way of compensation for his loss of office such a sum as may be agreed between him and the Tottenham Company, or, failing agreement, as shall be determined by a single arbitrator to be appointed by the President for the time being of the Institution of Gas Engineers. Provision is made for the taking over of other officers and servants of the Waltham Company, who will be eligible as co-partners of the Tottenham Company on the same conditions as officers and servants of the Tottenham Company are so eligible—but only with the consent of the Directors in the case of any officer or servant who does not elect to enter the pension scheme of the Company.

The price to be charged by the Tottenham Company, otherwise than under special contract, for gas supplied to consumers within the Waltham district during the period of ten years from and after the reading of the meter indices in respect of the quarter following the date of transfer may exceed the price per therm for the time being charged by the Company in the Tottenham district by the sum of 4d. per therm, and thereafter by the sum of 3d. per therm. For the purpose of ascertaining the rate of dividend payable on the ordinary stock, the price charged by the Company shall be deemed to be that charged by them for gas supplied in the Tottenham district.

It is proposed that the name of the Company shall be changed to the Tottenham and District Gas Company; and that the existing "A" consolidated ordinary stock of the Company shall be converted into "B" consolidated ordinary stock and 5 p.ct. preference stock. For each £100 of "A" stock entitled to a standard dividend of 5 p.ct. per annum, there is to be exchanged £100 of "B" stock and £30 of preference stock. To carry this into effect, there will be created £120,000 of "B" ordinary stock and £36,000 of 5 p.ct. preference stock. Power is taken to raise new capital to the extent of £200,000 (including premiums) in "B" stock or preference stock, with the usual borrowing powers. The section relating to the capital reserve fund reads:

> If the clear profits of the undertaking in respect of any half-year (after the making of provision for the payment of the authorized dividends on the ordinary and preference stock of the Company, and the interest on the debenture stock, mortgages, and temporary loans of the Company in respect of that half-year) amount to a less sum than, in the opinion of the Directors, will be sufficient to permit of the reduction of the price of gas in the next following half-year by one-fifth of a penny per therm, the Directors may, if they think fit, appropriate out of the profits of the undertaking in respect of that half-year any sum not exceeding £5000 to a fund to be called the "Capital Reserve Fund."
>
> The moneys forming the capital reserve fund or any portion thereof may be invested in securities in which trustees are authorized by law to invest, or may be placed on deposit at interest with the Company's bankers, or may be applied and expended for the general purposes of the Company to which capital is properly applicable, or may be used partly in the one way and partly in the other.
>
> The amount standing to the credit of the capital reserve fund and the total of the sums applied therefrom for capital purposes shall be separately shown in the accounts of the Company.

The demand for gas within the Tottenham Company's and the Waltham Company's limits of supply has increased, and is still increasing; and it is desired that the Company should be authorized to construct additional works for the manufacture and storage of gas and residual products. There is power to specify sizes and materials of pipes and fittings, and to make the requisite inspections. There is also a clause providing for the cutting-off of dangerous supplies, if due notice to repair be disregarded by the consumer.

[*Parliamentary Agents: Messrs. Lees & Co.*]

WINDERMERE GAS AND WATER COMPANY.

This Bill contains provisions relating to both the gas and the water portions of the Windermere District Gas and Water

Company's undertaking. The standard rate of dividend on the gas capital authorized to be raised by the Company's Act of 1862 is fixed at 10 p.ct., and on the 1889 capital at 7 p.ct., with a standard price of 15d. per therm, and a slide of 5s. p.ct. for each one-fifth of a penny per therm rise or fall in the charge for gas. Power is given to the Board of Trade, in appropriate circumstances, to revise the standard price. The calorific value of the gas is to be 500 B.Th.U. The charges authorized are to have effect as from the commencement of the quarter ending on June 24, 1929. For the hire of a prepayment meter and fittings, the maximum charge shall be 2·4d. per therm if a cooking stove is included, and 2d. without a cooking stove. The charge for a prepayment meter without fittings is to be a maximum of 1·2d. per therm or 10 p.ct. per annum on the cost of the meter, whichever shall be the higher. The clause giving power to purchase residuals is included, and also one conferring authority to specify sizes and materials of pipes and fittings. A maximum of 2s. is asked for special meter readings. Special purposes, renewal, and reserve funds are specified; and there are a number of other modern gas clauses.

[*Parliamentary Agents: Messrs. Sherwood & Co.*]

YORK TOWN AND BLACKWATER GAS COMPANY.

The consolidation and conversion of the existing capital of the York Town and Blackwater Gas Company is sought by this Bill, and power is asked to raise additional money. The population within the limits of supply of gas and electricity is increasing; and the Company have raised and expended all their capital and loan capital except the sum of £2200. On Jan. 1, 1929, the 300 original shares, the 730 old shares, and the 5300 new ordinary shares, all of £10 each, will be converted and consolidated into one class of stock, to be called consolidated ordinary stock, entitled to a standard rate of dividend of 5 p.ct. per annum. For each original share, there will be given in exchange £20 of consolidated ordinary stock; for each old share, £14 of stock; and for each new ordinary share, £14 of stock. The 150 preferred shares of £10 each, the £49,715 of preference stock, and the 440 (Twyford) preference shares of £10 each will be converted and consolidated into one class of 5 p.ct. preference stock, to be called consolidated preference stock. For each preferred share there will be given in exchange £12 of consolidated preference stock; for each £10 of new preference stock, £10 of stock; and for each (Twyford) preference share, £12 of stock. As to additional capital, the Company may raise by the issue of ordinary or preference (after taking into account premiums or discounts) £100,000; and any sum so raised may be applied to the purposes of the gas or the electricity undertaking, as the Company may determine.

The slide up or down from the dividend at the rate of 5 p.ct. per annum on the ordinary stock is to be 2s. 6d. for each one-fifth of a penny per therm increase or decrease in respect of any half-year. If in any half-year the dividend so payable on the ordinary stock comprises an amount of less than 5s. p.ct., the Directors may add the same to the reserve fund or defer payment of that amount and pay the same with the next or some succeeding dividend. The standard price for gas within the limits of supply (other than that part to which section 34 of the Order of 1924 relates) shall be that prescribed by section 3 of the Order of 1921, or such other price as may from time to time be prescribed by the Board of Trade. There are clauses to permit of the offering (with the approval of the Board of Trade) of stock created under the Bill to the gas and electricity consumers and persons in the employ of the Company at the then value thereof or for subscription by the public. The customary borrowing powers are suggested. One clause reads:

> *Substitution of Card Index for Shareholders' Address Book.*—Notwithstanding anything contained in section 10 of the Companies Clauses Consolidation Act, 1845, as from time to time applied to the Company, the Company may substitute for the shareholders' address book provided under that section a card or other index (of a type to be approved by the Auditors of the Company) containing the names and addresses of the several holders of ordinary stock and preference stock of the Company; and that section in its application to the Company shall be read and have effect accordingly.
>
> Notwithstanding anything in the Companies Clauses Consolidation Act, 1845, it shall not be necessary after the passing of this Act to authenticate the register of the holders of ordinary stock and preference stock of the Company by affixing the common seal of the Company to such register.

The qualification of a Director of the Company shall be the possession in his own right of consolidated ordinary stock and consolidated preference stock, or either of them, of the nominal value of not less than £500. There are provisions for the establishment of profit-sharing, and for the election of one or two Employee Directors, after the total investments of the employees in ordinary stock of the Company shall exceed the nominal amount of £20,000. The qualification of an Employee Director shall be fixed by the scheme, with the limitation that he shall have been not less than seven years in the constant employ of the Company, and shall have held for not less than twelve months prior to the date of election, and shall continue to hold, not less than £100 nominal value of the ordinary stock of the Company. His fees for attendance at the Board are to be not less than his ordinary day's pay nor more than four times that amount.

The name of the Company is to be changed to the Yorktown (Camberley) and District Gas and Electricity Company. There are up-to-date provisions relating to the supply of gas and electricity. For special meter readings a maximum of 2s. 1s suggested within the urban district of Frimley, and 2s. 6d. outside.

[*Parliamentary Agents: Messrs. Hargreaves & Crowthers.*]

"THE LANCASHIRE COALFIELD: THE WIGAN FOUR-FEET SEAM."*

The latest publication (No. 10) of the Fuel Research Division dealing with the physical and chemical survey of British coal seams describes laboratory experiments carried out for the Department by the Lancashire and Cheshire Coal Research Association on the Wigan Four-Feet Seam of the Lancashire Coalfield.

A frontispiece detailed map and a geological and general description of the coalfield are given, and its proved resources are stated to have been estimated at 4240 million tons.

The samples examined consisted in all but two cases (where run-of-mine samples were taken from consignments) of pillars of coal cut vertically from the face of the seam, including a portion of the roof and floor, and were representative of the Outwood, Kearsley, Clifton, Tyldesley, Atherton, Leigh, Ince, Bryn (Ashton-in-Makerfield), Garswood (Ashton-in-Makerfield), and Golborne districts.

Full analyses are given of the sections of each sample, including laboratory carbonization assays, examination of ash, agglutinating value determinations, in several cases washing tests, and a description of the microscopic features of a representative (Bryn) sample.

The results of these investigations are summarized at the end in tabular form, and interesting conclusions are drawn forming a valuable comparative survey of the whole seam.

Briefly, the seam is shown to yield a good coking coal. It is used chiefly as a house or a gas coal. Moisture figures are normal for this type of Lancashire coal, averaging about 3 p.ct.; the ash content varies from 2·6 to 9·9 p.ct., but lies mainly between 3 and 4 p.ct.; the volatile matter is high, averaging about 36 p.ct.; and though the swelling varies considerably, on the whole, strong coke buttons are obtained. All the samples show a fairly high calorific value, 13,160 to 14,340 B.Th.U. per lb. (air-dried).

The agglutinating values of the sections vary considerably, but indicate definitely that the seam is too valuable as a coking coal to be "wasted" as a house coal.

A point which rather detracts from the value of the whole publication is the inclusion of the weathered section representing the Ell Hole Seam in the Outwood district. This was known to have suffered oxidation, manifested in the results by a very low agglutinating value, poor coke, and vitiated tar and liquor yields. In an important publication of this type, such possibly misleading figures are better omitted.

It is rather disappointing to find "caking index (agglutinating value)" occurring repeatedly throughout the text. The tests referred to are agglutinating value determinations; and it will be found that the author of the method referred to decries the use of the term "caking" in his publication, while the term "caking index" is used by several other investigators to define a related but distinctly different test.

The last section of the book consists of three plates giving full-size reproductions of photographs of eight cokes obtained from the samples in the Gray-King assay apparatus. A careful examination of these and comparison with the corresponding agglutinating values lead to the conclusion that no information, and possibly only an erroneous impression, is furnished by the reproduction of these illustrations. In view of the mass of literature which it is necessary to peruse nowadays, it is a pity that such useless matter should be included; its inclusion has also probably added an unnecessary considerable portion to the cost of the publication.

M. B.

* Department of Scientific and Industrial Research, Fuel Research. Physical and Chemical Survey of the National Coal Resources No. 10. H.M. Stationery Office, Adastral House, Kingsway, W.C. 2, 1927. Pp. VIII. + 60; price 3s. net.

Institute of Fuel.—A meeting will be held in the Lecture Room of the Chemical Society, Burlington House, Piccadilly, W. 1, on Wednesday, Feb. 8, at 6 p.m., when a paper entitled "The Use of Thermal Storage in Industry" will be read by Mr. Stanley Hopkins, and be open for discussion. The Chairman will be Mr. W. H. Patchell, Past-President of the Institution of Mechanical Engineers. Members are invited to bring guests; and advance copies of the paper can be obtained about Feb. 4, on application to the Secretary. Further meetings have been arranged at the same hour and place on the following Wednesdays: March 14, April 18, and May 9.

MIDLAND JUNIOR GAS ASSOCIATION.

A Meeting of the Association was held on Thursday, Jan. 19, at the Birmingham Council House, under the chairmanship of Mr. H. R. HEMS.

ODDS AND ENDS ON A GAS-WORKS.

By D. J. WARD, of Birmingham.

[EXTRACT.]

COMMUNICATION BETWEEN EXHAUSTER HOUSE AND RETORT HOUSE.

On many works the retort house is situated a good distance from the exhauster house, and thus the retort house foreman is not in quick or easy communication with the driver in the exhauster house. Information such as hourly make, calorific value, change of pull, and the like, is constantly wanted, and the installation of the following two instruments greatly facilitates the transference of these items, especially in the case of a vertical retort plant, where the instruments would be installed on the charging stage.

The first is a Navy telephone, which transmits the sound of the voice with considerably more power than does the ordinary instrument. The foreman can hold conversation with the exhauster house with ease, even when he is in the vicinity of considerable noise, which prevails in the average retort house at most times.

The second instrument in this connection is for registering the calorific value at any time. Particularly in a vertical retort house, it is of great assistance to those in charge of the gas-making plant to know the quality at frequent intervals. If a C.V. recorder is installed in the exhauster house, the C.V. may be registered (say) every half-hour. The apparatus consists of two voltmeters, one with a big dial and one with a small, which have been calibrated together, and are connected in series in circuit with a variable resistance which is capable of being altered by means of a movable contact. The dials of the voltmeters are divided into any convenient number of divisions—say, fifty—and are marked in B.Th.U. from (say) 450 to 500. The man in the exhauster house reads the C.V. recorder, and alters the resistance until the small dialled indicator situated near the recorder shows the prevailing C.V. The instrument in the retort house immediately registers the same reading, and if placed in a conspicuous position can easily be seen from most parts of the plant.

HEIGHT REGISTERS FOR HOLDERS.

The holders on the works are often situated fairly far apart, and away from the governor house, entailing a long walk every hour for the estimation of gas stock. On a big works this is a nuisance at certain times, as usually the valvesman is engaged altering governor pressures, and taking hourly makes. At the Windsor Street Works, he also has to look after the boosting plant. The register I am about to describe makes the estimation of the hourly stocks the work of a moment. Merely by depressing a switch, the height of the holder in feet and inches can be read off from two dials worked by the holder itself. An operating drum and coils are made to revolve by the rising or falling of the holder. An insulated coil wound round the drum is tapped off at set points, and connections are made to a spiral copper band running round the outside of the coil. This band is divided into complete rings by a horizontal ¼-in. gap; and the spiral, as it revolves, actuates a slide which always keeps a copper contact on one of the rings. In effect, the revolution of the drum puts in or cuts out more or less of the coil; this variation in resistance being recorded on a voltmeter marked off in tens of feet. Fixed to the end of the primary coil is a separate secondary coil, round which are fixed copper studs at equal distances from one another; the coil being tapped off and connected to these as before. As the drum revolves so copper contacts alternately touch stud after stud; the movement between each of the latter being caused by a 3-in. rise or fall of the holder. This movement operates a second voltmeter which is marked off in divisions—the large ones for the feet, the smaller for each 3 in. The two voltmeters are placed side by side, with a switch below to close the circuit when readings are to be taken.

All the holders at the Windsor Street Works have apparatus of this nature attached to them; all the dials being mounted on one board in the booster house. The holder stocks at any moment can be quickly determined by pushing the switches down, and reading off the dials.

HALF-HUNDREDWEIGHT SALES OF COKE.

Where a gas-works is situated in a densely-populated area in the poorer part of a big town, the sale of small quantities of coke and breeze for household use is a considerable item. The greatest portion sold is in half-hundredweights, with a smaller proportion of hundredweights, and still less two hundredweights, and the serving of customers becomes a slow and tedious procedure when several hundreds are attended to daily, especially where a weighing machine fed by hand from a stack is in operation. The ½-cwt. sales machines installed at Windsor Street are labour-saving, quick, and accurate.

A hopper is sunk in a pit, with its top edge level with the ground, and is fitted with a bottom door actuated from above. A travelling skip runs on two rails from underneath this hopper to a receiving hopper which it feeds, and which is erected on four girder columns. Under this elevated hopper are two small weighing hoppers fed from it, and balanced to weigh exactly ½ cwt. By means of two levers, these can be filled through two chutes from above; and a separate lever on each small hopper operates a door which liberates the ½ cwt. of small coke into the customer's barrow, sack, or push-cart. The sunken hopper is fed by carts which back on to a plank placed on edge along one of its sides, and the travelling skip is then filled, pulled up, and tipped into the overhead hopper.

A 6-H.P. electric motor in a small house above the top hopper drives a drum, round which is wound a cable attached at its lower end to the skip, which it pulls up or lowers down. The controlling box and starting handle are placed at ground level, and automatic cut-outs prevent the skip being raised or lowered too far. Each weighing hopper has a counter attached, so that daily sales may be quickly checked.

I would like to quote some actual figures obtained at the Windsor Street Works—one set taken during the coal dispute in 1926, and the other on a Saturday morning this winter. On May 12, 1926, 1888 customers were served in 9 working hours, by two men on the machine and two carts feeding the lower hopper. This is at the rate of 210 persons an hour, or approximately one person every 17 seconds. On Nov. 12 last, which was a Saturday, between the hours of 7.30 a.m. and 11.45 a.m. 883 customers were served; this being at the rate of 208 per hour—or again one person (approximately) every 17 seconds.

GRIT CATCHER FOR WATER GAS MACHINES.

The generally dusty atmosphere of a gas-works is made more so by finely divided coke dust being blown from the stacks of water gas machines where no dust catchers are in operation. There are various types of catchers, most of which employ water as the settling medium; but that known as the "Centriflovane" grit catcher, made by the Tipton Tub and Tube Company, Ltd., is particularly effective, and no water is used.

By means of an angle flange joint, a conical shell of mild-steel plates is fixed to the top of the superheater stack. This shell has a rounded top, and surrounds an inner cone, to the bottom of which the grit collecting pipe is fixed. Between the outer shell and the inner cone are specially shaped vanes or guides; and a weather hood placed over the top of the catcher prevents the entrance of rain or snow, thus keeping the grit dry, and preventing possible blockage and corrosion. The "blow" gases ascend to the top of the stack, and continue up between the shell and inner cone until they meet the vanes, where they are given a swirling motion, at the same time being split-up into a large number of thin streams. These travel in a course almost tangential to the circle of the inner cone, and are directed downwards by the rounded top. While ascending in a spiral manner, the grits are thrown against the surface of the inner cone, and fall to the bottom, where they are conveyed away by the grit pipe fixed there. The clean gases now take a central, upward, spiral course, and escape through the outlet on top, underneath the weather hood, into the atmosphere; there being no undue back-pressure thrown by the apparatus.

The great advantage of this catcher is that no water is used, and therefore there is no corrosion, while the grit is kept dry. The grit collecting pipe travels down the superheater stack, and out at the bottom above the stack valve, and so to ground-level. The pipe increases in diameter in its last 7 or 8 ft. so that a temporary storage is provided. By means of a canvas sleeve attached to the bottom, the grit can be periodically removed; the sleeve being hooked up to an eye attached to the pipe after each time of emptying. On an average week's continuous working, about 46 cwt. of grit are collected from each machine fitted with this catcher.

COAL DRAG.

On a works capable of carbonizing 1000 or more tons per day, large coal stacks and quick picking-up machinery are essential if the works are to be kept going normally in time of coal strike or cessation of transport. The electrically-driven drag described will handle 80 tons of coal per hour, picking it up from a stack, and depositing it into trucks ready for transmission to the retort house.

The machine stands on four heavy wheels driven by the grab motor, two of which are capable of being moved by a steering handle. A 60-H.P. motor drives two winding drums by means of a clutch so arranged that one is being driven while the other remains free, and *vice versa*. The coal is pulled along the ground by a horseshoe shaped scoop, which then runs up

an incline 6 ft. wide, over the machine, to discharge the coal at the top of the incline into a truck beneath. The incline is at an angle of 35° to the horizontal; the top, which carries a roller, being 14 ft. 6 in. above the ground. A wire cable from one of the drums runs over the roller above the truck, and down the incline to the scoop, to the front end of which it is attached. Another rope runs from the back end of the scoop through a snatch block suitably fixed above the far end of the stack, and back along the ground to the other drum. The operator puts his clutch in so that the one drum pulls the scoop away from the drag, and up the face of the stack; the other drum, meanwhile, being free, and allowing the cable attached to the front of the scoop to unwind. He now reverses the clutch mechanism, when the last-mentioned drum pulls the scoop towards the truck to be loaded. Meanwhile the first is free, and the cable round the snatch block unwinds. The best way to pick up a stack is to have a girder running along two of its sides at a height just above the top of the stack, while the railway line runs along the other two sides. Thus the snatch block can be attached at the right height, at any desired position; the drag being placed on the other side of the stack, and opposite to it. As the coal is picked up, so the block and drag are moved along; and any small heaps left can easily be cleared by moving the block or drag a little to one side.

THE BAILEY GAS METER.

The Bailey meter is of the "flow" type, and works on the principle of a differential pressure which varies in a definite and known relation to the rate of flow of gas in a main; the gas being measured accurately and corrected to any desired condition of temperature and pressure.

The differential pressure is set up by an orifice inserted in the main; two ¾-in. diameter standard pipes being connected to the main, one on each side of the orifice, these pipes leading to the recording instrument. The distances of the pipes from the orifice are determined for each installation, and are stamped on an extended tab attached to the orifice, so that they may be seen when the latter is in position. All sag in the connecting piping is carefully avoided, and the pipes are graded towards the main, so that any condensate will flow backwards, thus keeping the pipes clear. The meter records the rate of flow of gas on a 12-in. chart in thousands of cubic feet per hour; and a four-dial integrator gives the volume of gas passed, to the nearest 1000 c.ft., for the purpose of taking hourly makes.

The differential pressure used for the maximum flow is about 2-in. water gauge; and this operates a bell 12 in. in diameter, so that ample power for operating the recorder and integrator is provided, even at low rates of flow. The power-friction ratio is exceptionally high; and as the accuracy of all meters depends upon this factor the Bailey meter has a wide range of accurate operation, even at minimum flow.

VOTE OF THANKS.

Mr. W. MACNAUGHTON (Wolverhampton), in moving a vote of thanks to the author, mentioned that the installation of grit catchers at Wolverhampton had given entire satisfaction.

The resolution was seconded by Mr. S. J. D. WILLIAMS (Stourbridge).

Mr. J. H. GEE (Nechells) said he was much interested in the signalling device for conveying calorific value determinations to the retort house. He emphasized the need for the development of a robust gravitometer.

YORKSHIRE JUNIOR GAS ASSOCIATION.

A Meeting of the Association was held on January 21 at the Bradford Gas Department Showrooms, under the chairmanship of Mr. C. H. CHESTER, President (Wakefield).

MANUFACTURE OF MALLEABLE IRON PIPE FITTINGS.

By HENRY R. HISCOTT, of The Le Bas Tube Company, Ltd.

[This paper was presented by the author to the Waverley Association of Gas Managers at their annual meeting in Edinburgh on June 24, 1927, and was published *in extenso* in the "GAS JOURNAL" for July 13, 1927, p. 109. What follows is an abstract of the contribution.]

The author commenced by saying that it was really in the gas industry that the necessity for pipe fittings first arose. At first these fittings were made from pieces of wrought-iron plate, bent and welded-up—a method still in being for ordinary wrought-iron pipe fittings. On the advent of efficient casting methods, pipe fittings were made from cast iron more cheaply and in greater variety; but cast-iron fittings are crude, heavy, and brittle. To render them more serviceable, annealing and heat treatment were tried; and from this time the evolution of malleable iron fittings commenced.

At first malleable iron fittings were made by heat-treating ordinary grey iron castings, but were found unsatisfactory; and lengthy research had to be undertaken by the manufacturers before a thoroughly satisfactory method could be evolved. Sixty years of research work stands to the credit of The Le Bas Tube Company, who found that all processes should be governed by an adequate system of checks or controls. The most important control is that exercised over the mixture of the iron of which the fittings are made.

HOW A MALLEABLE FITTING IS MADE.

The author then described in detail the processes through which a malleable iron fitting has to pass between its raw and finished states. The first item is the weighing of the scrap iron and new pig which make up the charge. The latter, together with coke and limestone, is placed in a cupola, and is drawn off in a molten state into pouring pots, which are run off to the moulding boxes, or into ladles for the hand production of special fittings. When cool, the castings are examined, and all unsound ones removed to scrap bins. The perfect ones are placed in a shaking machine, which rids them of core sand; and thence they pass into a revolving cylinder, inside which are fine jets of sand which remove scale and rough surfaces. The sand-blasted fittings are then carefully examined for defects.

Annealing follows; this being a most delicate operation. During the annealing process many changes occur in the castings, depending on the composition of the packing medium, the range of oven temperature, and the time the heat is applied. The malleability of the fitting depends on the process. After annealing is completed, samples of the fittings are flattened under a hammer, to ensure that the process has been satisfactorily applied. Once again, if the fittings do not stand this test they are sent to the scrap bins for re-casting.

The next process is another clean-up in tumbling barrels, from which they move to tables, where they are again sorted and individually examined for defects. Then all fins, bosses, &c., are ground-off, and all faces are ground flat at right angles to the body of the fitting. All fittings which are not of the correct gauge are scrapped.

Then comes the screwing of the fittings—a most interesting operation. Satisfactory screwing demands much ingenuity and expense in the construction of special automatic machinery. In the works of The Le Bas Tube Company, this has been reduced to a fine art. After the fittings have been screwed, another inspection is made to ensure that no blow-holes or other defects have been uncovered by the machining operations. Then the pressure test—the last and most important feature in the long chain of controls and tests—is applied. For this, special machines are employed. The maintained pressure is 300 lbs. per sq. in.; and the test is carried out with a milky fluid easily visible if it should find its way out of a pin-hole.

Galvanizing is effected by placing the fittings into a wire basket, and lowering this into a bath of molten zinc for a few minutes.

TWO TYPES OF MALLEABLE FITTINGS.

There are two types of malleable iron fittings on the market—plain and beaded. Mr. Hiscott does not recommend the use of plain fittings in any circumstances, but considers that a reinforcing bead at the point where the greatest strain is applied should be part of every malleable cast-iron pipe fitting.

"While," said the author, "it is generally conceded that all pipes and fittings placed underground should be adequately coated and protected from corrosive attack, it is at the same time advisable to ensure that, if such tubes and fittings should ever be attacked, as much resistance as possible should be available. The comparative lightness of these malleable fittings does not make them satisfactory to resist corrosion as long as (say) a wrought-iron steam pipe fitting which has double the thickness of the malleable fitting; and common sense dictates that, all other conditions aside, the thicker fitting should be employed for underground service."

Concluding his remarks, Mr. Hiscott said that malleable iron fittings fill a greater need than ordinary forged fittings possibly can; and the difference in the methods of manufacture enables the former to be produced more cheaply than the forged wrought-iron fittings. In some cases high-grade malleable fittings work out at from one-third to one-half the cost of wrought fittings. This question of cost has been one of the greatest factors in the general adoption of malleable iron fittings.

Discussion.

Mr. J. D. LUPTON (Otley) asked for further information regarding malleable iron fittings when buried, as he had gathered from the address that they were not suitable unless covered with pitch.

Mr. J. W. HOLROYD (Elland) remarked that in the area covered by most of the members present, malleable iron fittings were not suit-

able for carcassing, except in the case of very large buildings. Carcassing of ordinary buildings was done in lead or compo. If malleable iron fittings were embedded in plaster, would there be any danger of corrosion?

Mr. J. W. BARKER (Bradford) asked if it would be possible to make low-pressure fittings without the beading, so that when being fitted round door casings, &c., no more room would be taken up.

Mr. E. BAILEY (Spenborough) remarked that he had experience of carcassing in that district with iron pipe, which had been satisfactory. He saw no reason, except, perhaps, from the point of view of expense, why this should not be carried out satisfactorily in smaller buildings. Regarding the fittings which Mr. Hiscott had shown, he (Mr. Bailey) did not think there was sufficient room for a good grip to be obtained by a pair of dogs; and he considered that the beading could be easily damaged by the fitting slipping in the tool. This would result in an unsightly job. The area of the malleable iron fittings seemed to him to be smaller than wrought iron, particularly as far as elbows and tees were concerned. There appeared to be more space in the curved part of the wrought iron fittings. Regarding the laying of malleable iron fittings in the ground, the speaker related various experiences of this work, saying that in one of the undertakings with which he had served they had laid the pipes in wood casings surrounded by cement and sand, and had found them very satisfactory indeed. The cement and sand were easier to handle and work around the pipes.

Mr. J. W. CARLTON asked about the difference in corrosion between malleable-iron and wrought-iron fittings.

Mr. F. FRITH (Leeds) thought the remedy for corrosion was in their own hands—why subject the pipes to the effects of corrosion?

Mr. CARLTON remarked that some of them certainly had not the remedy in their own hands. It was a question for the gas engineer, not the distribution superintendent.

Mr. E. CROWTHER (Bradford) said it would be interesting to have the analysis of the finished material—the tensile strength and elongation at breaking-point—to compare with wrought iron and steel.

The CHAIRMAN observed that it had been the practice in Yorkshire to use lead or compo for house carcassing; and from the point of view of the installation of additional appliances after the completion of the house, this was an easy job in the case of such piping. He considered that it would be far more difficult to make additional connections when iron fittings were run. A whole length of the pipe would have to be taken out to get to the part to be screwed. He congratulated the manufacturers upon the care with which the fittings were examined and tested before leaving the works. He would like to know if the makers had investigated the question of providing some suitable preparation or coating for these fittings which would withstand the troubles indicated by previous speakers, and which would obviate the use of pitch and concrete.

Mr. C. T. B. ROPER (Bradford) commented upon the return to stores of malleable iron fittings showing fractures. Was this due to troubles in manufacture, lack of the necessary annealing, carelessness in use, or the general antipathy of some classes of workmen to anything new?

Mr. HISCOTT, in the course of his reply, exhibited various types of fittings. Regarding the burying of malleable iron pipes, he did not recommend this. On the question of carcassing, Mr. Hiscott instanced the fact that when lead pipe had been put into one large building (as a precaution against corrosion), the plasterers had reported a great number of holes in the pipes when the building was completed; this being due to other workmen having driven nails into them. As regards the cost, he questioned whether the threading cost more than the wiping of joints in the case of compo. Their fittings were coated with a special varnish; and in the case of being covered with plaster the tendency was that the moisture sweated outwards rather than inwards. He considered that the ordinary socket took up as much room as the beading in malleable iron fittings when being used on woodwork. As for the use of tools, he thought that it was rather easier to put pipe tongs on to malleable iron than on to ordinary fittings. Regarding the difference in internal diameter between wrought-iron and malleable iron fittings, he did not consider this apparent. He had no available information of the actual analysis of the finished product, but it could be obtained from their laboratory, where severe tests were continually made both on the solid bar and on tubular sections, for tensile strength and elongation. In the case of the solid bar, the figure was 50,000 lbs. per sq. in. with 5 p.ct. elongation, while the tubular section gave 48,000 lbs. Additions to existing supply pipes could be made easily, as most supplies for heating and cooking were usually run in accessible positions, and it was a simple matter to make fresh connections.

VOTES OF THANKS.

On the proposition of Mr. F. FIRTH, seconded by Mr. HOLROYD, a vote of thanks was accorded to Mr. Hiscott and The Le Bas Tube Company.

Mr. HISCOTT, responding, said they were at all times willing to give whatever information they could to gas undertakings.

Mr. S. T. S. MUSGROVE (Sheffield) proposed, and Mr. F. J. JACKSON (Sheffield) seconded, a vote of thanks to Mr. E. J. Sutcliffe and the Bradford Corporation Gas Department for the use of the meeting room.

This was acknowledged by Mr. E. CROWTHER, the Deputy Gas Engineer.

COAL AND BYE-PRODUCTS.

The Board of Trade returns relating to exports and imports for December give us the opportunity of comparing the full year with the conditions in the strike year of 1926, and the more normal one of 1925. In each section we will deal first with the month's returns, and then with the data for the twelve months.

COAL EXPORTS.

In December the quantity of coal exported was 3,886,405 tons. In December, 1926, the figure was 1,608,769 tons; and in December, 1925, 4,632,051 tons. The low value received in December is seen. In December, 1927, it was £3,124,874; 1926, £1,885,313; 1925, £4,275,360. In these figures gas coal in December accounted for 482,320 tons; in December, 1926, 264,269 tons; and in December, 1925, 594,867 tons. The values were: 1927, £359,846; 1926, £278,572; 1925, £481,521. The average value of the exported gas coal in December was about 14s. 11d. per ton.

Taking the whole year, the coal exports in volume were somewhat better than in 1925; but the figures show that the year of the strike, compared with 1927, lost coal business in other countries to the amount of nearly 30 million tons. Last year the aggregate of the exports was 51,149,193 tons, as against 20,596,372 tons in 1926, and 50,817,118 tons in 1925. The values of these quantities were: 1927, £45,530,795; 1926, £19,137,106; 1925, £50,477,211. Thus it will be seen that, although a somewhat larger quantity of coal was exported last year than in 1925, the value was something like £5,000,000 less. It is observed that, taking the complete year, British gas coal continues to be much appreciated abroad. True, buyers were favoured last year by lower prices, but quality is also persuasive. In the year, of the total quantity of coal shipped, 6,569,712 tons were classified as "gas coal." That figure compares with 2,756,056 tons in the strike year, and 6,820,414 tons in 1925. The values of these quantities of gas coal were: 1927, £5,395,499; 1926, £2,311,560; 1925, £6,272,545.

GAS COKE.

Turning to gas coke, the December shipment amounted to 115,774 tons, compared with 4235 tons in 1926, and 169,864 tons in 1925. The values were: December, 1927, £120,540; 1926, £6879; 1925, £173,205. The average value per ton in December last was £1 os. 9·8d.

In the complete year, gas coke did somewhat better than in 1925; the business abroad being represented by 999,096 tons, as against 387,323 tons in 1926, and 889,281 tons in 1925. The values were: 1927, £1,044,662; 1926, £401,681; 1925, £663,351.

Regarding metallurgical coke, throughout the year there has been a relatively poor market. The total of the trade overseas amounted to 806,888 tons, which compares with 376,356 tons in 1926, and 1,222,476 tons in 1925. The value in 1927 was £920,708; 1926, £431,711; 1925, £1,463,585.

TAR PRODUCTS.

During the year there has been a greater shipment of benzole to other countries. In December, 676,081 gallons were exported, which brought up the total for the year to 1,970,666 gallons, compared with 420,980 gallons in 1926. Of naphtha 63,297 gallons were sent overseas last year, as against 66,726 gallons in 1926. Tar, oil, creosote, &c., was in good demand in December, the shipment amounting to 5,831,022 gallons, compared with 660,623 gallons in December, 1926. The total for the year was 41,771,689 gallons, as against 35,864,045 gallons in 1926.

SULPHATE OF AMMONIA.

The shipment of sulphate of ammonia in December was 26,213 tons, compared with 4771 tons in 1926. The total for the year was 265,325 tons, as against 161,553 tons in 1926. Of the total for last year, Spain and the Canaries took 87,190 tons, and Japan formed a close second with 85,379 tons. There was a considerable falling-off in the trade with the Dutch East Indies; the business done in that quarter being 9497 tons last year, as against 19,839 tons in 1926.

GAS OIL IMPORTS.

The year exhibits a considerable decline in the quantity of gas oil imported, compared with 1926. This, of course, was to be expected. The quantity received in December was 3,900,743 gallons, as against 11,352,648 gallons in December, 1926. In the year, the total quantity delivered was 96,003,390 gallons; while in the strike year no less than 117,832,958 gallons were landed.

Candidates for Membership of the Institution.—Intending candidates for membership of the Institution of Gas Engineers should send forms of proposal to the Secretary, 28, Grosvenor Gardens, Westminster, S.W., by the 11th inst., for submitting to the Council, who are now considering arrangements, for admission by examination only.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Gas Dehydration by Calcium Chloride.

SIR,—The letter which you reproduced in your last issue from the "Gas Age-Record" of America contains one or two points to which I should like to publish a reply.

The writer of the letter appears to fear the effect of drops of calcium chloride, entrained from the washer described in my paper read on Nov. 16, and reported in your columns on Nov. 23, 1927.

I think I might point out what the writer may have failed to remark, that the gas after dehydration in one section of the washer was treated for naphthalene in the other section, and that the slightest quantity of entrained solution could not fail to be effectively removed and noticed. As a matter of fact, I find no entrainment; and it is hardly to be expected that there would be in a washing apparatus of this description.

I am not surprised that the method he alludes to, of treating air in a practically empty space, using powerful sprays to create the necessary intimacy of contact, was found detrimental. The alternative treatment by cooled water was mentioned in my paper, and I presume it is found to possess a similar feature of entrainment, with a corresponding loss of efficiency.

I have to-day examined the main on the outlet of the washer; and there is absolutely no trace of calcium chloride. The internal surface is in perfect condition, notwithstanding that the plant has been working over eighteen months.

I can definitely state that no corrosion effects due to the carrying-over of calcium chloride are present on the plant at our works, but that, on the contrary, we are minimising corrosion at every point following the dehydrating plant.

C. HARRIS.

Gas-Works, Taunton,
Jan. 28, 1928.

Thermal Calculations.

SIR,—It is evident from Prof. Travers' reply to my criticisms that he has missed my point entirely. Far be it from me to suggest that scientific methods should be abandoned. If Prof. Travers had looked properly into my figures, he would have found that they contained all that is necessary for the purpose in view, and all that is known at present, which, I admit, is not very much.

The figures I put forward are facts. I drew attention to Prof. Travers' having left the exothermic reactions of coal out of his calculations altogether. He starts with assumptions which practice has shown are *plus* or *minus* 25 p.ct. wrong either way, and works out his figures accurately with several decimals.

My figures do not express an inventor's pious hopes as to what might have been, &c. Many more years than I care to remember and hard work have convinced me, and I am not entirely alone.

The application of science always goes in the direction of simplifying matters, or should do so; and added charm to a great scientist is his simple, everyday language. Tell a gas engineer he is suffering from subcutaneous ecchymosis, and you scare him stiff; but tell him he is suffering from a black eye, and he understands you.

Prof. Travers' assertions seem to me to be identical with those made by many eminent scientists in the early days of the railways, when they proved by intricate calculations that a locomotive running on rails could not, mathematically speaking, drag a train of carriages. It was also proved mathematically that the air pressure on the human system obtained at speeds of (say) 30 or 40 miles an hour would be fatal.

HARALD NIELSEN.

Jan. 30, 1928.

SIR,—The recent letters in the "JOURNAL" from Mr. Harald Nielsen and Prof. M. W. Travers are piquant readings.

The question at issue is an interesting one, as the devotees of low-temperature carbonization are divided into two cults, the majority being in favour of applying the heat of the combustion of the heating fuel externally to the retort, while the minority cult, of which Mr. Nielsen is the High Priest, maintain that the distilling heat should be applied in a gaseous form internally through the coal contained in a rotary retort.

The writer confesses to being a devotee of the majority cult, but grasped at the opportunity for investigating the feasibility of Mr. Nielsen's ideas when the latter, early in 1920, introduced him to his friend, Mr. James Rankin Garrow, an analytical chemist, who held what he believed to be the master, or key, patent of the process of passing a heated gaseous medium through a revolving retort.

This patent, applied for in 1918, but only granted in 1921—No. 158,002—was submitted to me, and it revealed the ominous point that the Patent Office Examiner had caused to be printed on Garrow's complete and published specification three references which the Examiner maintained had anticipated completely Garrow's claims.

The three references are:

Besemfelder	No. 13,830, 1899
Cail Naef	,, 18,279, 1900
Rigby (wet carbonizing) . . .	,, 1,676, 1914

At this time Mr. Nielsen had as far as my knowledge goes no patents concerning the distillation or carbonization of coal of any description—in fact, in 1921, he was a newcomer into the arena of coal carbonization.

I pointed out to them both the seriousness of the position and the impaired value of Mr. Garrow's patent, but my interest in the question at the time was purely a technical one, being keenly desirous of investigating a small rotary retort heated on Garrow's plan which had been installed in a disused retort house at Chatterley, Stoke-on-Trent.

From an engineering point of view, it was not a very impressive affair; and though I worked assiduously for several months side by side with Mr. Nielsen to try to make something out of the process, I at last abandoned it, and left the retort to Mr. Nielsen to do the best he could.

To write all about the troubles would occupy too much space, but to my mind the fundamental result was similar to Dr. Travers' comments in his communication to the "JOURNAL."

In due course, Mr. Bryan Laing joined up with Mr. Nielsen and myself, and he succeeded in securing a contract for a full-sized rotary retort with accessories, condensers, washers, &c., to be supplied to the "Carbon Products Company," of India, an offshoot of the great Tata Steel & Iron Company, of Bombay.

The drawings were prepared by Mr. Nielsen, and very beautiful drawings they were; the retort and accessories being constructed by Messrs. W. C. Holmes & Co., Ltd., of Huddersfield. The retort was shipped to India some time about the end of 1922.

The retort was 90 ft. long by 9 ft. diameter, and the estimated throughput was 100 tons per diem; the cost being, as I understood at the time, some £20,000 to £30,000.

The complete installation was fully described in "Engineering" for March 24, 1922, which description was reprinted in booklet form and scattered broadcast in considerable numbers. In addition to the fine illustration, there were some pages of elaborate thermal calculation by Mr. Nielsen.

About this time, however, I had severed my connection with Messrs. Laing and Nielsen, and our Syndicate title "L.M.N." became "L. & N."

Naturally I was deeply interested in the results of this monster retort, but to this day have never been able to gather what results it gave—in fact, everything connected with it is shrouded in mystery.

Now if Mr. Nielsen would give us a résumé of the results obtained from this retort, it would be of inestimable value to the gas community and would be of further value in settling the controversy between himself and Prof. Travers—and it might cap the time-old adage that "an ounce of practice is worth a pound of theory."

F. D. MARSHALL.

Weybridge, Jan. 29, 1928.

REGISTER OF PATENTS.

Scrubbers.—No. 281,958.

WRIGHT, S., of Timperley.

No. 15,353; June 9, 1927.

The invention refers to apparatus of the type comprising a series of superposed compartments round which the gas passes in a circumferential direction, being passed through each compartment in succession, by means of a fan or the like, by way of an opening in the floor of each compartment, and in which the gas comes into intimate contact with the liquid by being passed through a mist or spray thereof produced by a centrally-disposed rotary atomizer.

In apparatus of such type as heretofore proposed it has been found in practice that the gases tend to pass directly from the inlet to the outlet of each compartment; and to obviate this, the present invention provides a partition mounted within each compartment so as to divide the latter into sub-chambers, an opening in said partition whereby the sub-chambers are connected, and a vertical baffle situated at the entrance to the compartment and adapted to direct the gas completely around the first sub-chamber before entering the second sub-chamber, which latter it must traverse circumferentially before leaving the compartment.

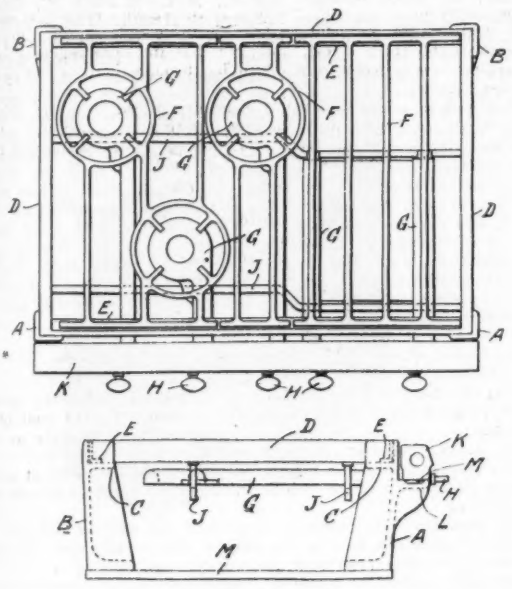
Hotplates for Cookers.—No. 281,374.

FLAVEL, P. W., of Leamington.

No. 21,351; Aug. 30, 1926.

One object of this invention is to provide for systematizing the component parts so that hotplates of various capacities can be readily assembled. A further object is to provide for the easy removal of all grids, burners, and other component parts for cleaning and transport.

We reproduce a plan and end elevation of the hotplate. A, B, are respectively front and back pedestals, each provided with a bearing comprising a pair of portions C of L shape in cross-section; and D is a loose rectangular frame supported and located by the bearings on the pedestals. The frame D is provided with flanges E for supporting grid members F. G are burners supported at their inner ends by the nipples of gas cocks H and at their outer ends by bars J



A New Flavel Hotplate.

rigidly attached to the ends of the loose frame D. The hotplate is shown attached to, and assembled at the top plate of, a cooker body M. K is a gas supply pipe or tap rail attached by screws or the like to bearings L formed integral with the front pedestals A; the bearings being arranged with transversely opposed facing strips forming an air space M.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for Jan. 11.]

Nos. 1—620.

BISSELL, W.—"Gas burners." No. 590.
BISSELL, W.—"Fittings for gas burners." No. 591.
BISSELL, W.—"Gas fires." No. 592.
CARPENTER, C.—"Retort settings." No. 177.
KEMPTON, C. H.—See Bissell, W. No. 590.
KEMPTON, C. H.—See Bissell, W. No. 591.
KEMPTON, C. H.—See Bissell, W. No. 592.
LANGER, R.—"Controls for gas burners." No. 374.
MILES, T. V.—"Gasholders." No. 153.
NEWTON, CHAMBERS, & CO., LTD.—See Miles, T. V. No. 153.
SMITH, E. W.—"Prepayment mechanism for gas meters." No. 403.
SMITH METERS, LTD.—See Smith, E. W. No. 403.
SOUTH METROPOLITAN GAS COMPANY.—See Carpenter, C. No. 177.

[Extracted from the "Official Journal" for Jan. 18.]

Nos. 621—1363.

ALDRIDGE & RANKEN, LTD., AND BENNETT, W.—"Apparatus for manufacture of gas." No. 701.
CARPENTER, C. C.—"Gas governors." No. 1214.
CHEMICAL ENGINEERING AND WILTON'S PATENT FURNACE COMPANY, LTD.—"Distillation of tar." No. 849.
COGGINS, G. M.—"Gas burners for furnaces." No. 666.
DAVIS, R. H.—"Means for testing illuminating power of lamps." No. 804.
FRASER, H. A.—"Means for separating oil from gas." No. 1147.
GREEN, S. P., AND HAGUE, A. V.—"Gas compressors." No. 1035.
HETHERINGTON, J.—See Fraser, H. A. No. 1147.
KOSTER, E. W.—"Gas compressor." No. 1353.
LAING, B., AND NIELSEN, H.—"Distillation of carbonaceous substances." No. 959.
PRICE, W. L.—See Fraser, H. A. No. 1147.
SOUTH METROPOLITAN GAS COMPANY.—See Carpenter, C. C. No. 1214.
WILTON, T. O.—See Chemical Engineering and Wilton's Patent Furnace Company, Ltd. No. 849.

MISCELLANEOUS NEWS.

CARDIFF COUNCIL TRIES TO OUST GAS.

Tenants' Strong Opposition to the Scheme.

In "The Western Mail" for Jan. 25 appeared an article which stated that the tenants on the Mynachdy and Ely housing estates of the Cardiff Corporation are "in a turmoil owing to alarming notices as to the use of gas for lighting purposes which they have received from the City Treasurer." They are threatened with dispossession of their houses if they continue the use of gas as an illuminant.

The offending circular from the City Hall, which is dated Jan. 16, and has been received by several hundreds of tenants at Mynachdy and Ely, is as follows:

> Sir, or Madam,—It has been reported to me that instead of utilizing electricity for the lighting of your house you have, without the consent of the Corporation, installed gas pipes, fixtures, and fittings.
>
> The Corporation, having wired the house for electric light, expect their tenants to make use of that form of lighting. If tenants prefer gas to electricity for cooking purposes, application should be made to me for permission to put in a gas cooker.
>
> I have reported upon the matter to my Committee, and am instructed to give you notice that unless you discontinue the use of gas for lighting purposes you will be required to give up possession of the house.

The circular was sent to the tenants in whose houses gasfittings for lighting had already been installed; and there are over 700 of them on the two estates.

The tenants complain of the cost of electricity. One of them explained that in the houses gas is the only good medium for keeping the rooms free from damp. Gas lighting implies warming; and another point is that while an electric bulb costs 2s. 6d., a gas mantle costs a few pence. The tenants state that they do not intend to discontinue the use of gas for lighting.

On the question of the legality of the Corporation's action, the "Western Mail" mentions that, in connection with the Newport Corporation Bill of 1925, the Committee of the House of Commons accepted the protecting clause for which the Gas Company originally asked; and it was put in as sub-section 4 of the Newport Corporation Bill in the following words:

> (4) The Corporation shall not make or impose, under the powers of this section, any term, conditions, or restriction with respect to the form of light, heat, power, or energy to be used in any house, shop, office, warehouse, or other building, or on any lands, or with respect to the taking from any particular local authority, company, body, or person of any form of light, heat, power, or energy.

The agreement entered into by each tenant on taking possession has no reference whatever to any restriction as to the use of any form of illuminant. The imposition of such a restriction is, therefore, to say the least of it, unwarrantable, and the tenant, who has in no way bound himself to use electricity to the exclusion of gas, appears to be safeguarded against any unjust interference with his liberty.

RECORDING CALORIMETERS AND EXAMINERS' FEES.

In July, 1922, the London County Council fixed the fees payable to gas examiners at 16s. a testing on weekdays and 20s. a testing on Sundays, bank holidays, Christmas Day, and Good Friday. Reporting then, the Public Control Committee stated that representations made by the gas examiners for an increase in the scale of fees had been postponed until the recording calorimeters required by the Gas Regulation Act, 1920, which would be capable of giving a continuous record of the gas supplied, were installed at the testing places. Recording apparatus of the type required is now available, and will shortly be brought into use at three out of seventeen testing places within the county. Pending the installation of similar apparatus at the remaining fourteen testing places, the ordinary non-recording tests will continue to be made.

The examiners visit each testing place at which non-recording tests are made on every day in the year, including Sundays and public holidays; but the use of the recording calorimeter will, in normal circumstances, reduce the number of visits to two a week. The Committee are advised that testing by the new instruments will be more exacting, both in time and skill, than the present method; and they are of opinion that the fee payable for testing at those places at which the recording apparatus will be in use should be provisionally fixed at £1 1s. a day (inclusive). In view of the fact that the precise amount of work involved is not definitely established, depending as it does to a large extent on the requirements issued from time to time by the Gas Referees, it is proposed to review at the end of twelve months the amount of the fee in the light of the experience then gained.

The Committee recommend accordingly.

INQUIRY AT CONWAY.

An inquiry was held at Conway by Mr. F. GREGSON WILLIAMS, an Inspector of the Ministry of Health, into an application by the Conway Corporation to borrow £21,805 for the erection of new gas-works on the Morfar.

The TOWN CLERK (Mr. Hugh Parry) said that every year the Corporation were losing heavily on the gas undertaking; last year's loss being £2200. The price of gas at the present time was 6s. per 1000 c.ft.

The INSPECTOR mentioned that a Mr. Vaughan Hughes had written to the Ministry suggesting that there should be one central gas undertaking for Llandudno, Colwyn Bay, and Conway; and he wished to know in what light this was viewed.

The *Mayor* (Councillor L. C. Atkinson) said it might be a very good scheme, but he did not think there was the slightest chance of the authorities coming together. He agreed that gas would be cheaper if this could be done.

After Councillor *W. R. Harker* (Chairman of the Gas Committee) had pointed out the necessity of proceeding with the scheme, the INSPECTOR said that if it was not a question of geographical impossibility, something might be done in reference to the proposed joint scheme. All the authorities were engaged in making alterations to their works.

Evidence was given by Mr. *Dixon*, the Manager of the Gas-Works; and no opposition being offered, the inquiry was closed.

NEW BENZOLE PURIFICATION PROCESS.

In Operation at the Mitchell Main Coke Ovens and Bye-Product Plant.

Last month, at a meeting of the Midland Section of the Coke Oven Managers' Association, Mr. F. T. Hatswell, Manager of the Coke Ovens and Bye-Product Plant at the Mitchell Main Colliery, Wombwell, presented a paper on "A New Process for the Purification of Benzole for Motor Fuel."

He observed that the new process, which has been adopted at the plant at Mitchell Main, obviates the large loss of valuable fuel hydrocarbons which takes place with the acid process of purification, and aims at the same time to manufacture a product free from spontaneous polymerizable hydrocarbons. The process is simple, and has the advantage of requiring little attention. It is carried out in the following manner.

A charge of crude benzole is pumped into the washers, where it is washed with dilute acid in order to extract the bases; and, after careful separation of this acid, a predetermined quantity of the purifying "medium" is added, the benzole being kept in a state of agitation. The whole is then heated to a temperature of from 50° to 55° by means of a circular dry-steam coil in the washer, and maintained at this temperature for about one hour, at the end of which time the medium is separated from the benzole by pumping through a convenient filter. This filter is cylindrical in form, and has filtering surfaces of flannel at the top and bottom; the benzole being led in about half-way up the side. From both top and bottom the outlets are fitted with pipes leading to the same destination, and conveniently united.

From the filter the benzole flows to a convenient storage tank where large quantities of treated spirit may be stored prior to running back to the washer for neutralization and final distillation. The neutralization required has been found to be very light indeed—so light in fact that an experimental neutralizer of the bubbler type laid between the filter and the still has been found to give satisfactory results, thus enabling the treated benzole to be passed straight from the washer to the rectification still if so desired. The actual distillation is carried out exactly as in the present-day acid-washing process.

With regard to the used medium itself, this consists in brief of a mixture of a special absorbent material and ferric sulphate in a particularly active form; ferric sulphate as usually met with being almost useless for benzole rectification owing to its extreme slowness of action. The actual medium is ground to a state of fine division and is stored in such a manner as to keep it dry and free from alkaline vapours such as ammonia, which tend to turn it basic and, consequently, useless. The action of the medium is (1) to polymerize such impurities in the crude benzole as would, on keeping, form gums or colouring matters; and (2) at the same time to destroy impurities which tend to separate from the sulphur. The products of the reaction in both cases are absorbed by the microporous material, while useful, unsaturated hydrocarbons—as, for example, olefines—are but little attacked, if affected at all.

One interesting point is the necessity of removing bases from the crude benzole before the medium is added. This is an absolute necessity, since such bases as pyridine immediately enter into combination with the ferric sulphate and cause the medium to clog, with the result that it lies inert on the floor of the washer, and no purification is effected.

The elimination of strong-acid washing presents many advantages to the coke oven manager. The problem of the disposal of acid tar is dispensed with. There is also a great saving of time.

Further points which commend the new method of purification are:

1. Increased yield of refined benzole.
2. Less tendency to deposit free sulphur.
3. Gum content of the benzole practically *nil*.
4. Colour of the product well maintained.
5. Greater volatility of the spirit. Consequently easier starting of the engine, quicker acceleration, and more perfect carburation.
6. The lighter hydrocarbons permit the introduction of some of the higher boiling fractions.

SPENT GAS LIQUOR.

Its Effects upon Sewage Disposal Works.

At a meeting of the Southern District of the Institution of Municipal and County Engineers at Devizes on Saturday, Jan. 21, a paper on "Spent Gas Liquor in Relation to Sewage Works" was read by Mr. H. Ross HOOPER, O.B.E., M.A., M.Inst.C.E., formerly Engineering Inspector to the Ministry of Health. The lecturer said that, provided the volume of spent gas liquor did not exceed 1 p.ct. of the volume of domestic sewage, and was introduced into the sewers in a small, steady flow, no great harm arose. An extra filter might be necessary, but the sewage could be purified without apparent difficulty. The question of the purification of spent gas liquor before being discharged into the sewers was more a matter for the gas engineer than for the surveyor. Having regard to the experimental and research work at present being conducted, with the view of being the better able to deal with this difficult fluid, it was hardly the time to incur great expenditure to remedy the troubles that arose, but it was not the time to sit down complacently and await the result of the labours of others engaged on the work. Knowledge of the subject had, however, reached one fairly definite stage—namely, that the discharge of spent gas liquor into the sewers should, as far as possible, be uniform, and proportionate to the flow of domestic sewage through the 24 hours. If this was adopted, an important step had been taken towards improvement.

Mr. BOWES (Newbury) told how the problem was being dealt with at Newbury. Concrete storage tanks were installed at the gas-works, and the gas liquor ran out at the rate of 2 gallons a minute, which reduced the amount of gas liquor to less than 1 p.ct. of the sewage.

Mr. A. W. JAKEWAY (Devizes) said they had had serious trouble in this respect at Devizes for several years, and they had at present a Joint Committee of the Gas and Sewage Committees investigating the matter.

Mr. PICKERING (Cheltenham) expressed the opinion that the discharge of waste gas liquors into sewers, particularly since the introduction of vertical retorts at gas-works, was causing a great deal of difficulty, especially where the activated sludge process was in operation. Having recently carried out a series of tests with a view to ascertain what effect the gas liquor had on the treatment of sewage, he could endorse the statement made by Mr. Ross Hooper as to the advantage of providing for a uniform discharge of the liquor proportionate to the flow of the sewage. The difficulties of purifying gas liquor before it entered the sewers appeared to him to be almost insurmountable. On the other hand, should the treatment of the sewage outfall works be practicable, it did not seem reasonable that local rates should bear any extra cost entailed.

The CHAIRMAN (Mr. J. B. Thompson, of Swindon) said the matter was one which ought to be approached in the spirit of sweet reasonableness between the gas engineer and the borough engineer.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *Jan.* 30.

The market for pitch continues quiet, and little business is reported. The price to-day is nominal at 75s. to 80s. per ton.

Creosote is steady at about 5¾d. per gallon.

Tar spirits are unchanged; current prices being as follows: Pure benzole, 1s. 5d. to 1s. 6d. per gallon; pure toluole, about 1s. 10d. per gallon; 95/160 solvent naphtha, 1s. 3d. per gallon; pyridine, about 6s. per gallon.

Tar Products in the Provinces.

Jan. 30.

With the exception of tar acids, tar products markets generally remain dull.

Pitch is quiet, and nominally lower prices prevail.

Creosote oil is still firm, and business continues for both export and the home trade at very close to existing figures.

In water-white products there is little or no business doing.

Naphthalene remains steady; but there is little business passing.

Crude carbolic is still very firm in spite of the fall which has taken place in crystals.

Cresylic acid has improved, and business has been done at full rates up to the end of June next.

The average prices of gas-works products during the week were: Gas-works tar, 52s. to 57s. Pitch—East Coast, 67s. 6d. to 72s. 6d. f.o.b. West Coast—Manchester, 65s. to 67s. 6d.; Liverpool, 67s. 6d. to 72s. 6d.; Clyde, 70s. to 72s. 6d. Benzole, 90 p.ct., North, 1s. 1d. to 1s. 2d.; crude, 65 p.ct. at 120° C., 10d. to 10½d., naked at makers' works; 50/90 p.ct., naked, North, 1s. 3d. to 1s. 4d. Toluole, naked, North, 1s. 4d. to 1s. 5d. nominal. Coal-tar crude naphtha, in bulk, North, 7½d. to 8d. Solvent naphtha, naked, North, 9d. to 9¼d. Heavy naphtha, North, 8¾d. to 9¼d. Creosote, in bulk, North, liquid, 7⅛d. to 7⅜d.; salty, 7⅜d. to 7½d.; Scotland, 7½d. to 7⅝d. Heavy oils, in bulk, North, 8¾d. to 9¼d. Carbolic acid, 60 p.ct., 2s. 4d. to 2s. 5d. prompt. Naphthalene, £13 to £15; salts, £5 to £5 10s., bags included. Anthracene, "A" quality, 2½d. per minimum 40 p.ct., purely nominal; "B" quality, unsaleable.

TRADE NOTES.

Pipes Limited.

This Company has just been formed for the sale of cast-iron gas and water pipes. The Managing Director is Mr. A. S. Arup, and the address of the firm is 34, Fenchurch Street, E.C. 3. The telephone numbers are Royal 8634, 8635; and the telegraphic address is "Castronpip," Fen, London.

The "Victory"

PREPAYMENT METER

WITH

PLATE PRICE CHANGER.

OUTSIDE VALVE BOX.

EVERY PART INTERCHANGEABLE.

MADE BY

THE PIONEERS

OF THE SLOT METER,

SAWER & PURVES

(BRANCH OF METERS LIMITED),

MILES PLATTING, MANCHESTER.

RADFORD ROAD, NOTTINGHAM.

45-47 Westminster Bridge Rd., LONDON, S.E.

COAL TRADE REPORTS.

From Our Own Correspondents.

NORTH-EAST COAST.

There has been a slightly easier feeling during the past day or two, but on the whole prices have been steadily maintained. The volume of trade remains at a good level, though it is largely of the hand-to-mouth variety. Bookings for February are being made at recent prices, but foreign consumers are unwilling to buy far ahead, and competition from other producers remains keen.

Though the volume of trade is steadily improving, and markets are being gradually recaptured, it is at prices which are unfortunately still unremunerative, as is shown regularly by the monthly wages ascertainments. Arbitration proceedings are due to take place early in February on the proposed revision of the percentages on wages basis rates, but, if any reduction is made, the great majority of collieries need all the assistance they are likely to get, and price reductions cannot be expected.

Quotations remain generally unchanged. Wear Special gas makes ask 16s., and best qualities 15s. 6d. f.o.b. Seconds are 13s. 6d. to 14s. Coking is quieter, but 14s. to 14s. 6d. is still quoted for unscreened. Best Durham bunkers are about 14s. 9d. f.o.b. Northumberland steams quote 13s. 9d. to 14s. for best screened sorts. Gas coke is 22s. 6d. to 23s. f.o.b. for shipment.

YORKSHIRE AND LANCASHIRE.

Gas coals are being inquired for well ahead under contract in Yorkshire and Lancashire. It is likely that this branch of the industry will be affected by the new scheme now being considered by the coalowners in various northern counties. Previous efforts in this direction have failed; but with unity the owners may at least secure prices nearer to the cost of production than before.

The industrial market is not recovering to any marked degree, although slightly better prices have prevailed of late for washed fuels. Some consumers are placing contracts well ahead, probably in anticipation of the effect of the new scheme now being put forward.

The export market still continues very dull, and the only hope appears to be the immediate and effective working of the above-mentioned scheme.

The trade in domestic coal continues to rule on the quiet side, although the recent colder weather will probably result in an improvement in this direction. Collieries are, however, in a position to execute orders promptly, and in some instances have accumulated stocks. Prices are steady on the whole, with slight weakening in some directions; while it may be that some of the more stabilized coals will shortly be reduced if the present consumption is not increased.

The following are the Humber bunker and export prices, f.o.b. usual shipping ports: South Yorkshire—Hards, Association, 15s. 6d. to 15s. 9d.; screened gas coal, 16s. to 16s. 6d.; washed trebles, 16s. 6d. to 16s. 9d.; washed doubles, 15s. 6d. to 15s. 9d.; washed singles, 15s. to 15s. 6d.; washed smalls, 11s. 3d. to 11s. 6d.; smithy peas, 17s. to 18s. 3d. per ton. West Yorkshire—Hartley's (f.o.b. Goole), 14s. 6d. to 15s. 6d.; screened gas coal, 14s. 6d. to 15s. 6d.; washed trebles, 16s. 6d. to 16s. 9d.; washed doubles, 15s. 6d. to 15s. 9d.; washed singles, 15s. to 15s. 6d.; washed smalls, 11s. 3d. to 11s. 6d.; unwashed trebles, 15s. to 15s. 3d.; unwashed doubles, 11s. 6d. to 12s; rough slack, 9s. 6d. to 10s.; coking smalls, 9s. 3d. to 9s. 9d. per ton.

Derbyshire and Nottinghamshire—Top hards, 16s. 3d. to 16s. 9d.; washed doubles, 15s. 6d. to 15s. 9d.; washed singles, 15s. to 15s. 6d.; washed smalls, 11s. 3d. to 11s. 6d.; rough slack, 9s. 9d. to 10s. per ton.

Yorkshire, Derbyshire, and Nottinghamshire—Screened steam coal, 14s. 6d. to 15s.; gas coke, 23s. 6d. to 25s. 6d.; furnace coke, 17s. 6d. to 18s. 6d. per ton.

In Lancashire, the house coal trade is quiet, with spot lots at low prices. Washed fuels are in big supply. Prices: Lancashire best house, 31s. to 32s.; seconds, 27s. to 28s.; common, 19s. to 21s.; kitchen, 22s. to 24s.; good slack, 10s. to 15s.; Yorkshire selected house, 31s. to 34s.; house, 26s. to 28s.; cobbles, 18s. to 20s.; house nuts, 15s. to 17s.; washed doubles, 12s. to 14s.; washed singles, 12s. 6d. to 13s. 6d. per ton in wagons at pit.

MIDLANDS.

Trade in the Warwickshire and Cannock coalfields is disappointing. Predictions of improvement are not being fulfilled, and it looks as if it was a case of the wish being father to the thought. Demand for house coal is below what is usually experienced at this season of the year. One result is that stocks are accumulating at the wharves, wagons are held up, and work at the collieries is retarded. The average working week is from four to five days.

The industrial side of the trade is not much better placed than the domestic. Supplies for factories are bought sparingly, despite optimistic reports that the general industries are improving. If anything, demand for slacks has eased off a little, and distributors are able to obtain a slight concession, say 6d. per ton, for "spot" lots. No difficulty is experienced in meeting a moderate demand for nuts and beans, nor is there any trouble in the matter of deliveries, which can be given promptly.

Hinckley and the Earl Shilton Gas-Works.—It was announced at a recent meeting of the Hinckley Urban District Council that, subject to the confirmation of shareholders of the Earl Shilton Gas Company, and the sanction of the Board of Trade, the offer of the Hinckley Council with reference to the acquisition of the Earl Shilton Gas-Works had been accepted. Mr. Burton said that a special meeting of the Council was being held to discuss details. The Hinckley Council only recently embarked on a scheme involving an expenditure of £25,000 for additions to plant at Hinckley.

CONTRACTS OPEN.

Coal.

The Borough of Lancaster Gas Department invite tenders for the supply of gas coal, nuts, or slack. [See advert. on p. 281.]

EXTENSIONS.

Development at Chorley.

Extensions to the Chorley Gas-Works, involving an expenditure of £62,555, were approved by the Town Council on Jan. 26. The scheme provides for alterations and improvements at a cost of £31,245; a new holder, £26,935; governor and valve house, £2000; and mains, £2275. Alderman T. Heald said the Gas Committee's policy covered gas production and distribution for twelve or fifteen years. There were undeveloped areas; and it was essential that reserve plant should be available. The existing plant would produce 1,200,000 c.ft. per day. The projected scheme would raise this to 2,100,000 c.ft. The existing storage dated from the time when the Gas Committee sold 89,000,000 c.ft. of gas a year. The spending of this money on development would not of necessity mean an increase in the gas charges.

Vertical Retorts for Peebles.—The Peebles Town Council have decided to adopt a scheme for the installation of vertical retorts, at a cost of £10,000.

South Metropolitan Gas Company.—Subject to audit, the Directors of the Company recommend a final dividend for the past year on the ordinary stock at the rate of 6¾ p.ct. per annum, less the interim dividend of 2¼ p.ct. paid in September last.

Meter Testing at Leeds.—A report on the work of the Leeds Gas Meter Testing Station during 1927, made to the City Magistrates last week, states that 30,687 meters were tested, of which 29,168 were found correct and were stamped; the remainder being rejected. Meters came to the Leeds station, in addition to those of the city itself, from Harrogate, Huddersfield, Ossett, Ripon, and other places in the West Riding area.

Long Service at Birmingham.—At the last meeting of the Birmingham Gas Committee, Alderman J. H. Lloyd (Chairman) presented addresses expressing appreciation of good service to the following, on the occasion of their retirement: William J. Raffety, gasfitter, 46 years' service; George H. S. Grimes, gasfitter, 31 years' service; Henry C. Willis, Swan Village Works, 36 years' service; Richard Mullis, Windsor Street Gas-Works, 40 years' service; George James Teall, mains and service inspector, 48 years' service; and George F. Hartland, gasfitter, 42 years' service.

Sutherland Meter Company.—An offer has been made by the Vulcan Stove Company, Ltd., of Exeter, for the purchase of the preference and ordinary shares of the Sutherland Meter Company, Ltd., of Witton, Birmingham. The preference shares of £1 each will be purchased at par, and 10s. will be given for each ordinary share. It is stated that the offer is conditional on its acceptance by holders of 75 p.ct. of the total number of preference and 80 p.ct. of the total number of ordinary shares, or such less number as the purchasers may be willing to accept; and the date fixed for the acceptance of the offer is Feb. 17.

New Holder for Oswaldtwistle.—A new holder is proposed to be erected at Oswaldtwistle, at a cost of £10,000. Mr. G. E. Rhodes (Engineering Inspector to the Ministry of Health) conducted an inquiry on Jan. 20 into the Council's application to borrow the necessary money. The Clerk said the Council had accepted the tender of Messrs. R. & J. Dempster, of Manchester. The Council had two holders, one a two-lift column-guided holder with a capacity of 275,000 c.ft., and the other a spiral-guided one with a capacity of 168,000 c.ft. The larger holder was erected 54 years ago, and extended 41 years since. There had been no addition to the storage capacity for 27 years, though the output of gas had increased from 72,335,000 to 131,431,000 c.ft. The old holder was in a dilapidated condition; and the Council were faced with either repair or replacement. The estimated cost of repair was £2500, and then it would be a patchwork affair. The Council proposed to replace it with a 500,000 c.ft. four-lift spiral holder.

British Commercial Travellers' Club.—The first annual meeting of the British Commercial Travellers' Club was held at the Club premises, 24-28, New Oxford Street, W.C. 1, last week, and a satisfactory report of progress was made by the Secretary. The Club opened on March 19 last, under the Presidency of Sir Ernest Benn, Bart., with a membership of 216, and at the close of the year the membership had reached 600. A membership of one thousand is aimed at, and during the early weeks of the New Year, new members have been coming in almost daily, and there is little doubt that the thousand figure will be reached at an early date. The Club has already proved of considerable value to the many commercial travellers who use it daily for lunch and purposes of recreation; and it has also been visited by many commercial travellers from overseas. It was decided to ask Lord Riddell to become the Club's President for 1928. The Chairman, Mr. T. W. Hancox, reporting to the meeting, said that he had interviewed Lord Riddell on the matter, and had received his provisional consent to accept the office. The Club is equipped with a large restaurant, billiards room, card rooms, writing rooms, &c., and membership is open to all commercial travellers irrespective of whether they are members of a commercial travellers' association or not. Membership can be secured by the nominal payment of £1 for a qualifying share; the Club being registered under the Industrial and Provident Societies Act, by which the liability of every member is limited to the share mentioned. The annual subscription is one guinea. A hearty invitation is extended to the readers of the "JOURNAL" to view the Club at any time convenient to themselves; the Club hours being from 9.30 a.m. to 11.30 p.m.

Lighting Trades Staff Dinner and Dance.

The members of the staff of Lighting Trades, Ltd., of Oriel House, Farringdon Street, E.C. 4, were the guests of the Directors at the fifth annual dinner and dance at the Piccadilly Hotel on Friday last, when the Chairman of the Company, Mr. H. J. Mitchell, supported by other members of the Board, presided at the dinner over a gathering numbering 140. Following the Loyal toast, Mr. Mitchell expressed the pleasure it afforded him and his co-Directors in again meeting the staff in social intercourse. On this occasion they welcomed the addition to the number brought about by the absorption of Messrs. J. & W. B. Smith, Ltd. In thanking the staff for their past services and co-operation, Mr. Mitchell remarked that, with a continuance of such loyal support, he regarded the future with optimism. Mr. Albert T. Metcalfe, the General Manager, in proposing the toast of "The Directors," eulogized the team work (which was so desirable to success nowadays) of the staff, on whose behalf he thanked the Board for their kind consideration in the past, and the excellent entertainment they had provided that evening. Thanks were accorded from the chair to Miss Cottrell and Mr. Marrable for the admirable manner in which the evening's programme had been carried out. The Directors and their wives joined heartily in the dancing which followed.

Extensions to Horizontals at Dewsbury.—The Ministry of Health have sanctioned a loan of £17,350 for gas-works extensions by the Dewsbury Town Council, which will increase the carbonizing capacity of the works by 40 p.ct. It is intended to instal a further series of horizontal retorts, which will bring about the completion of a scheme of plant reconstruction which has been in progress for several years past. Messrs. Gibbons Bros., of Dudley, who have been responsible for most of the reconstruction work, are to instal the new retorts.

Metropolitan Gas Company of Melbourne.—Messrs. John Terry & Co., of 7, Great Winchester Street, E.C. 2, Agents for the Company, inform us that they have received a telegram from their Principals informing them that the net profits for the six months to Dec. 31, 1927, were £105,800. A dividend of 7s. 6d. per share has been declared, an amount of £33,000 has been transferred to the reserve account, and a sum of £61,125 has been carried forward. Dividends were payable in Melbourne on Feb. 1, and those to absentee shareholders will be posted by an early mail.

Gas Supplies from the Ruhr.—The Berlin correspondent of the "Financial Times," in a message dated Jan. 28, says that the Municipal Council of Hanover have decided, against votes only of Communists, that the city shall be supplied with gas direct from the Ruhr coal mines. The contract is to be signed with the Aktiengesellschaft für Kohleverwertung—that is to say, with the Company formed in Essen mainly by proprietors of Ruhr mines and works to ensure the more economical exploitation of coal. It ensures the supply of Ruhr coal gas for thirty years. The Company undertake to supply gas at a cheaper rate than can be done by the local gas-works, so that not only will the general public benefit, but the "competing capacity" of Hanover industries will be enhanced.

New Gas-Works for Philadelphia.—The Koppers Company, of Pittsburg, are to finance and build an $8,000,000 coke oven gas plant in Philadelphia, to augment the supply at present produced at the city gas-works, under lease to the United Gas Improvement Company. According to the "Gas Age-Record," the new plant will have a capacity of about 5000 million c.ft. of gas a year. This will increase by 25 p.ct. the output of the existing plant. The contract between the United Gas Improvement Company and the Koppers Company stipulates for the supply of the coke oven gas at 34c. per 1000 c.ft. This is regarded as a fair figure for the gas, which has to be piped to the present plant some distance away. This new arrangement will remove the necessity of making plant extensions at the gas-works.

Centenary of the Hot Blast for Smelting.—This year marks, says the "Iron and Coal Trades Review," the centenary of the introduction of the use of the hot blast for the smelting of iron by J. B. Neilson, who was Manager of the gas-works of the City of Glasgow. It occurred to him that it would be advantageous to heat the air for combustion in smiths' fires, in cupolas, and in the blast furnace; and he took out a patent, which was attended with great success when tried at the Clyde Iron Works, for making pig iron. The economic benefit, in the reduction of the use of fuel was unmistakable; and ultimately the method was adopted throughout the whole of the iron trade in this country. The modern development in the production of iron may be considered to have begun with this great advance in blast-furnace practice. The use of the hot blast for smelting iron with anthracite was also introduced into the United States, and thus was laid the foundation of that great industry in Eastern Pennsylvania.

The Halifax Corporation Gas Committee recommend the Town Council to sanction a reduction in the price of gas, to date from the March meter readings, by 12½ p.ct.

The Plymouth Corporation Gas Committee have decided, subject to the approval of the Town Council, to provide additional coal storage accommodation at their works at an estimated cost of £7000.

At the Accrington District Gas Board meeting on Jan. 26, the Chairman (Alderman Barlow) presented sets of books on scientific subjects to two members of the Accrington Grammar School Scientific Society—Leslie Howarth and James Haworth—winners in the senior and junior sections of an essay competition following a visit of thirty students to the gas-works at Great Harwood. The Manager (Mr. A. J. Harrison), who adjudicated, reported that the papers were of a remarkably high standard.

STOCK MARKET REPORT.

A COMPLETE change came over the monetary situation last week. The large amount of foreign credit in this country which during the previous week foreshadowed an early reduction in the Bank Rate lost its significance, the French credits being tied up in Treasury Bills, and the American credits proving to be of a temporary nature only. Prices of gilt-edged and investment stocks kept up fairly well; but as hopes of cheaper money faded, the markets became more subdued, and towards the close of the week there were distinct signs of weakness.

Among the many new issues, the most important was the South Australian 5 p.ct. registered stock at 98. This is ¼ p.ct. higher than recent Australian flotations, and the price appears to be justified by the present market values of such issues.

The popularity of Industrial shares continued, and, despite considerable profit taking, many shares closed higher. This was particularly the case with Gramophone shares, the rise in Duophones being remarkable.

There was a greater demand for Gas Stocks. The final dividend announcement of the South Metropolitan Company at the rate of 7½ p.ct. for the half-year, making 6¼ p.ct. for the year, following on the higher distribution of the Commercial Company, led to a demand for these and other companies' stocks in the anticipation of further improved announcements. Another factor which brought in inquiries was the Gas Light and Coke Company's proposal to permit the acquisition of stock in multiples of £1. With regard to quotations, the most prominent change was a rise of 2½ points in Commercial ordinary to 95-98. In addition, Alliance and Dublin 5 p.ct. and Liverpool 5 p.ct. were both marked up 1 point.

The following transactions were recorded during the week:

On Monday, Alliance and Dublin 97, Croydon sliding-scale 101, maximum dividend 8½, European 7½, 7 11/16, Gas Light and Coke 93½, 93⅝, 93¾, 94⅜, 3 p.ct. debenture 60, 60¼, Imperial Continental 146, 146½, 147½, Primitiva 20s. 6d., 20s. 7½d., 20s. 9d., 20s. 11¼d., 4 p.ct. debenture (1911) 76¾, South Metropolitan 103¾, 104⅛, South Suburban 5 p.ct. 106⅞, 107½.

On Tuesday, European 7¾, Gas Light and Coke 93⅝, 93¾, 94⅜, 94½, 3 p.ct. debenture 60¼, Hornsey 3½ p.ct. 77⅝, 78, Primitiva 20s. 7½d., 20s. 9d., 20s. 10½d., 21s., 4 p.ct. debenture (1911) 75⅝, 77¼, Tottenham "B" 92½. Supplementary prices, South Suburban 7 p.ct. debenture 99.

On Wednesday, Aldershot 4 p.ct. preference 71, Alliance and Dublin 96½, Brighton and Hove 6 p.ct. 111½, 5 p.ct. 99½, 100½, Commercial 96, 96½, European 7⅝, Gas Light and Coke 94, 94¼, 94½, 94⅜, 94⅝, Imperial Continental 3½ p.ct. debenture 69, Newcastle 3½ p.ct. 79½, Oriental 110¾, Primitiva 20s. 9d., 21s., 21s. 1½d., San Paulo 6 p.ct. preference 8½, South Metropolitan 103¾, 104, 104½, 104¾, South Suburban 5 p.ct. 106½.

On Thursday, Alliance and Dublin 96½, 97¼, Bombay 22s. 9d., Bournemouth "B" 12⅛, Cape Town 8¼, Cardiff 100, European 7⅜, 7⅝, 7¾, Gas Light and Coke 94½, 94⅜, 95, 95¼, 3½ p.ct. 62¾, 63¾, Imperial Continental 147⅞, 148, Primitiva 20s. 9d., 20s. 10½d., 21s., 21s. 1½d., South Metropolitan 104½, 104⅞, 105, 105½.

On Friday, Commercial 95, European 7⅞, 8, Gas Light and Coke 95, 95⅛, 95¼, 95⅜, Imperial Continental 146¾, Primitiva 20s. 9d., 20s. 10½d., 21s. 1½d., South Metropolitan 104½, 105¼, 6½ p.ct. debenture 103, Southampton 5 p.ct. maximum 79. Supplementary prices, Bath 5 p.ct. debenture 94, Gas Light and Coke, Brentford 7½ p.ct. 103, Liverpool 5 p.ct. 89, 89½, 5 p.ct. debenture 99¼, 99⅜, Montevideo 6 p.ct. debenture 99¼.

In the Money Market funds at the end of the week were in short supply, and borrowers had to pay up to 5 p.ct. for fresh loans, while a further small amount had to be borrowed from the Bank of England at the same rate. Apart from the regular loans at the clearing banks, old day-to-day advances were renewable at 4 p.ct. The result of the Treasury Bill allotment caused a hardening in the discount rates. There was a comparatively small demand for the former, which averaged £4 1s. 9·98d. p.ct., or about 2s. 5¼d. p.ct. above the previous week's low average.

With New York offering sterling, the dollar exchange was easier, closing at 4.87 7/16. The Spanish currency was again firmer, and the Madrid rate closed lower at 28.71. German marks at 20.44½, Italian lire at 92.07½, and Belgas at 34.98¾, appreciated. Dutch florins declined slightly to 12.08.

With China giving a little support, Silver was firmer at 26½d. per oz., while in the bullion market Gold remained firm at 84s. 11½d. per oz.

The Bank Rate is 4½ p.ct., to which it was reduced from 5 p.ct. on April 21. Bankers' deposit rates are 2½ p.ct. The deposit rates of the discount houses are 2½ p.ct. at call and 2¾ p.ct. at notice.

Issue.	Share.	When ex-Dividend.	Dividends. Prev. Hf.Yr	Dividends. Last Hf. Yr.	NAME.	Quotations. Jan. 27.	Rise or Fall on Week.	Transactions Lowest and Highest Prices.
£			%p.a	% p.a.				
171,978	Stk.	Sept. 8	5	5	Aldershot 5 p.c. max. C.	68—73	..	..
412,992	,,	,,	4	4	Do. 4 p.c. Pref.	69—72	..	71
1,551,868	,,	Sept. 29	7	7	Alliance & Dublin Ord.	95—99	+1	95½—97½
374,000	,,	Jan. 12	4	4	Do. 4 p.c. Deb.	64—67*	..	..
522,554	,,	Aug. 25	—	7	Barnet Ord. 7 p.c.	103—108	..	..
300,000	1	Oct. 13	1/7½	1/7½	Bombay, Ltd.	21/6—23/6	..	22/9
170,000	10	Aug. 25	8½	8½	Bournemouth 5 p.c.	12½—13½	..	..
600,059	10	,,	7	7	Do. B 7 p.c.	12—12½	..	12½
375,050	10	,,	6	6	Do. Pref. 6 p.c.	10¾—11¼	..	..
50,000	Stk.	Jan. 12	3	3	Do. 3 p.c. Deb.	56—59	+1	..
162,025	,,	,,	4	4	Do. 4 p.c. Deb.	75—78	+1	..
357,900	,,	Aug. 25	—	7½	Brighton & Hove 6 p.c. Con.	108—111	..	111½
341,800	,,	,,	—	6/8/6⅔	Do. 5 p.c. Con.	98—101	..	99½—100½
1,327,500	,,	July 28	5	5	Bristol 5 p.c. max.	87½—88½a	..	..
855,000	,,	Sept 29	7	8	British Ord.	111—114	..	..
100,000	,,	Dec. 22	7	7	Do. 7 p.c. Pref.	114—117	..	..
120,000	,,	,,	4	4	Do. 4 p.c. Red. Deb.	72—75	..	..
200,000	,,	,,	—	33/2	Do. 5 p.c. Red. Deb.	93—96	..	..
100,000	10	Nov. 24	8	6	Cape Town, Ltd.	7¾—8½	+⅛	8½
100,000	10	Oct. 27	4½	4½	Do. 4½ p.c. Pref.	6—7	..	..
150,000	Stk.	Dec. 22	4½	4½	Do. 4½ p.c. Deb.	72—77	..	..
236,860	,,	July 28	6	6	Cardiff Con. Ord.	100—103	..	100
237,860	,,	Jan. 12	7½	7½	Do. 7½ p.c. Red. Deb.	101—104*	..	..
157,150	,,	Aug. 11	5½	5	Chester 5 p.c. Ord.	87—92b	..	..
79,185	1	Oct. 13	1/-	1/-	Colombo Ltd. Ord.	31/—33/-	..	..
24,495	1	,,	1/4½	1/4½	Do. 7 p.c. Pref.	20/—22/-	..	..
321,490	1	Oct. 13	1/92	1/9½	Colonial Gas Assn. Ld. Ord.	24/—26/-	..	..
173,900	1	,,	1/7½	1/7½	Do. 6 p.c. Pref.	20/—22/-	..	..
2,073,280	Stk.	July 14	—	5	Commercial Ord.	95—98	+2½	95—95½
475,000	,,	Dec. 22	8	8	Do 8 p.c. Deb.	55—58	..	..
800,000	,,	Sept. 29	11	11	Continental Union, Ltd.	28—33	..	..
200,000	,,	,,	7	7	Do. 7 p.c. Pref.	90—95	..	..
787,560	,,	Aug. 11	6½	6½	Croydon sliding scale	98—101	..	101
403,100	,,	,,	5	5	Do. max. div.	81—84	..	84½
492,270	,,	Aug. 25	6	6	Derby Con.	103—105e	..	..
55,000	,,	Dec. 22	4	4	Do. Deb.	71—73e	..	..
209,000	,,	Aug. 25	5	5	East Hull Ord. 5 p.c.	78—81	..	..
50,000	,,	Dec. 22	5	5	Eastbourne 5 p.c. Deb.	90—95	..	..
1,002,180	10	Sept. 29	13	14	European, Ltd.	7⅞—8	..	7⅞—8
6,747,460	Stk.	July 28	5	5	Gas Light & Coke 4 p.c. Ord.	94—96	+1	93½—95⅝
2,600,000	,,	,,	8½	8½	Do. 8½ p.c. max.	62½—64½	..	62½—63½
4,167,020	,,	,,	4	4	Do. 4 p.c. Con. Pref.	76—79	..	..
5,602,690	,,	Dec. 22	8	8	Do. 8 p.c. Con. Deb.	60—62	+1	60—60½
181,815	,,	,,	6	6	Do. 6 p.c. Br'tf'd Rd. Db.	101—104	..	..
1,642,770	,,	,,	5	5	Do. 5 p.c. Red. Deb.	96½—100½	+⅛	..
42,000	,,	—	7½	7½	Do. 7½ p.c. Ilford Deb.	..	..	..
82,500	,,	Aug. 25	6½	6½	Hastings & St L. 5 p.c. Conv	89—92	..	..
268,740	,,	,,	5½	5½	Do. 5½ p.c. Conv.	70—73	..	..
70,000	10	Oct. 13	†10	†10	Hongkong & China, Ltd.	12—13	..	..
179,200	Stk.	Aug. 25	5	5	Hornsey Con. 5½ p.c.	75—78	..	77½—78
1,976,000	,,	Nov. 10	10	10	Imperial Continental Cap.	145—148	..	146—148
223,180	,,	Aug. 11	8½	8½	Do. 8½ p.c. Red. Deb.	68—70	..	69
386,243	,,	Aug. 11	6½	7	Lea Bridge 6 p.c. Ord.	96—99	..	..
2,146,907	,,	Aug. 11	5½	5½	Liverpool 5 p.c. Ord.	89—91b	+1	..
600,000	,,	Sept. 29	7	7	Do. 7 p.c. Red. Pref.	103—105b	..	..
165,736	,,	Aug. 25	8	9	Maidstone 5 p.c. Cap.	107—112	..	..
75,000	5	Dec. 22	†7	†8	Malta & Mediterranean	6½—8½	..	..
541,930	Stk.	Nov. 24	†7	†6	Montevideo, Ltd.	92—94	+1	..
2,061,315	,,	July 28	5	5	Newcastle & Gateshead Con.	79½—80½d	..	..
860,929	,,	,,	4	4	Do. 4 p.c. Pref.	67½—68½d	..	..
691,705	,,	June 29	8½	8½	Do. 8½ p.c. Deb.	65½—66½d	..	..
131,788	,,	Aug. 25	—	6/18/0	North Middlesex 6 p.c. Con.	93—96	..	..
900,000	,,	Nov. 24	7	9	Oriental, Ltd.	103—113	..	110¾
188,190	,,	Dec. 22	7½	7½	Plym'th & Ston'house 5 p.c.	102—107	..	..
414,560	,,	Aug. 25	7½	7½	Portsm'thCon.Stk.4p.c.Std.	102—105	..	..
226,732	,,	,,	5	5	Do. 5 p.c. max.	76—79	..	..
2,334,464	1	—	—	—	Primitiva Ord.	20/6—21/6	+/3	20/6—21/1½
247,500	100	Dec. 1	4	4	Do. 4 p.c. Red. Deb.	90—98	..	..
685,000	Stk.	Jan. 26	4	4	Do. 4 p.c. Red. Deb. 1911	74—76*	−1	75½—77½
429,183	,,	Dec. 22	4	4	Do. 4 p.c. Cons. Deb.	74—76	..	..
160,000	10	Sept. 29	8	8	San Paulo 6 p.c. Pref.	8½—8¾	..	8½
125,000	50	Jan. 3	5	5	Do. 5 p.c. Red. Deb.	46—48	..	..
270,000	Stk.	Sept. 8	5½	5½	Sheffield A	103—104e	..	..
419,968	,,	,,	5½	5½	Do. B	102—104e	..	..
1,047,000	,,	,,	5½	5½	Do. C	102—104e	..	..
90,000	10	May 26	4	6	South African	4—6	..	..
6,869,895	Stk.	Aug. 11	7	5	South Met. Ord.	104—107	+1½	103½—105½
500,000	,,	—	—	—	Do. 6 p.c. Irred. Pf.	110—113	..	..
1,895,445	,,	Jan. 12	8	8	Do. 8 p.c. Deb.	59—62*	..	..
734,000	,,	Sept. 8	6½	6½	Do. 6½ p.c. Red. Db.	102—104	..	103
91,500	,,	Aug. 11	8½	8½	South Shields Con.	111—113d	..	..
1,343,796	,,	July 28	6½	6½	South Suburban Ord. 6 p.c.	105—108	..	106½—107½
868,837	,,	Dec. 22	5	5	Do. 5 p.c. Deb.	93—96	..	..
647,740	,,	Sept. 8	5	5	South'mpton Ord. 5 p.c.max.	78—81	..	79
121,275	,,	Dec. 22	4	4	Do. 4 p.c. Deb.	72—75	..	..
250,000	,,	Aug. 25	7	7	Swansea 7 p.c. Red. Pref.	108—106	..	..
200,000	,,	Dec. 22	6½	6½	Do. 6½ p.c. Red. Deb.	99—102	..	..
120,000	,,	July 28	7½	7½	Tottenham District A 5 p.c.	107—110	..	..
889,275	,,	,,	6½	6½	Do. B 3½ p.c.	91—94	..	92½
160,000	,,	,,	6½	6½	Do. 5½ p.c. Pref.	97—100	..	..
181,255	,,	Dec. 8	4	4	Do. 4 p.c. Deb.	74—77	..	..
238,251	,,	Sept. 29	5	5	Tynemouth Con. and New	81—83d	..	..
289,094	,,	Aug. 25	6½	6½	Uxbridge, Maidenhead, & Wycombe 5 p.c.	85—90	..	..
86,880	,,	,,	5	5	Do. 5 p.c. pref.	86—88	..	..
80,000	,,	July 14	8½	8½	Wandsworth, Wimbledon, and Epsom— Wandsworth A 5 p.c.	127—132	..	..
255,696	,,	,,	7	7	Do. B 3½ p.c.	107—112	..	..
432,685	,,	,,	5/19/0	5/19/0	Do. C and New	94—99	..	..
359,000	,,	,,	6½	6½	Do. Wimbledon 5 p.c.	102—107	..	..
98,600	,,	,,	7½	7½	Do. Epsom 5 p.c.	110—115	..	..
200,000	,,	,,	5	5	Do. 5 p.c. Pref	88—93	+1	..
88,416	,,	Dec. 22	8	8	Do. 8 p.c. Deb.	56—59	..	..
284,748	,,	,,	4	4	Do. 4 p.c. Deb.	75—78	+2	..

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